4.1 OPERATIONAL SAFETY/RISK OF ACCIDENTS

Section 4.1, Operational Safety/Risk of Accidents, describes those aspects of the existing environment that may impact operational safety, or that may be affected by an accident associated with the operation of the Long Wharf, including transportation of crude oil and petroleum products to and from the terminal. A summary of the existing vessel traffic levels and patterns and other marine terminals within the Bay Area, and a summary of the historical casualties involving tank vessels and marine terminals within the Bay Area is provided. This is followed by a description of measures in place to allow the safe movement of marine vessels within the Bay and to respond to emergency situations. Also included is a summary of laws and regulations that may affect the safety and potential risk from the facility and its operation. Finally, this section analyzes the potential for impacts and presents appropriate mitigation.

4.1.1 Environmental Setting

Bay Area and Long Wharf Vessel Traffic

Bay Area

Many types of marine vessels call at terminals in the San Francisco Bay Area, including passenger vessels, cargo vessels, tankers, tow/tug vessels, dry cargo barges, and tank barges.

Lightering (transfer of oil from one vessel to another) takes place in Anchorage No. 9. Lightering is normally conducted from a large tanker, whose draft is too deep to allow it to call at a certain terminal with a full load, to a smaller tanker. Lightering has decreased in the Bay Area since the inception of air quality regulations requiring receiving vessels to be equipped with vapor recovery.

Table 4.1-1 presents information on vessel visits during 2004 (Corps 2005). The numbers in the table represent inbound transits. The number of outbound transits is essentially the same. A vessel that visits multiple terminals is counted at each terminal.

The Harbor Safety Committee, using data from the Marine Exchange, publishes information on tank vessel arrivals and movements in the Bay area. Table 4.1-2 summarizes these data and Table 4.1-3 shows a breakdown by zone. Figure 4.1-1 shows the boundaries of the zones. As can be seen from Table 4.1-2, total tank vessel arrivals increased slightly from 2003 to 2004 while movements stayed approximately the same.

Long Wharf

Table 4.1-4 presents information on the number of tanker and barge calls to the Long Wharf by year since 2002 with projections for part of 2005. The number of vessel calls has been fairly constant.

Figure 4.1-1

Table 4.1-1
2004 San Francisco Bay Vessel Traffic

Location	Type of Vessel					Total Number of Vessels Visits
	Passenger and Dry Cargo	Tanker	Tow or Tug	Dry Cargo Barge	Tank Barge	
San Francisco Bay Entrance	2,455	730	424	16	306	3,931
San Francisco Harbor	34,230	16	542	161	67	35,016
Redwood City Harbor	29	0	110	8	0	147
Oakland Harbor	9,218	3	1,401	262	352	11,236
Richmond Harbor	58	378	3,586	390	1,395	5,807
San Pablo Bay and Mare Island Strait	4,029	430	1,510	576	417	6,962
Carquinez Strait	254	416	1,602	511	318	3,101
USACE 2005 Waterborne Commerce of the United States Calendar Year 2004 Part 4-Waterways and Harbors Pacific Coast, Alaska, and Hawaii.						

Table 4.1-2
2004 San Francisco Bay Tank Vessel Traffic

San Francisco Bay Region Totals	2004	2003
Tanker arrivals to San Francisco Bay	760	686
Tank ship movements and escorted barge movements	3,559	3,481
Tank ship movements	2,070	2,077
Escorted tank ship movements	1,016	1,026
Unescorted tank ship movements	1,054	1,051
Tank barge movements	1,489	1,404
Escorted tank barge movements	772	757
Unescorted tank barge movements	717	647

Table 4.1-3
Movements by Zone

Movements by Zone	Zone 1	Zone 2	Zone 4	Zone 6	Total
Total movements	2,298	3,398	0	1,694	7,390
Unescorted movements	1,056	1,722	0	801	3,3579
Tank ships	702	1,046	0	425	2,173
Tank barges	354	676	0	376	1,406
Escorted movements	1,242	1,676	0	893	3,811
Tank ships	714	968	0	439	2,121
Tank barges	528	708	0	454	1,690

Notes: Information is only noted for zones where escorts are required.
Every movement is counted in each zone transited during the movement.
Total movements are the total of all unescorted movements and all escorted movements.
See Figure 4.1-1 for a definition of the zones.

Table 4.1-4
Tank Vessel Calls at the Long Wharf

Year	Tanker Calls	Barge Calls	Total Tank Vessel Calls
2002	360	310	670
2003	372	373	745
2004	367	398	765
2005*	333	365	698

*** Projected to end based on actual number of vessel calls from Jan-Aug.**
Source: Chevron 2005

Outer Coast

Vessels entering and leaving the Golden Gate entrance to San Francisco Bay do so through the TSS which consists of a circular Precautionary Area with three traffic lanes (northern, main or western, and southern) exiting from the Precautionary Area. In a special one-time study, data compiled by the USCG VTC for November 1993 through July 1994, show that approximately 50 percent of the tankers used the western lane, while approximately 25 percent of the tankers used the north and south lanes, respectively. For all types of vessel traffic, approximately 25 percent used the west lane, while 37 percent used the north and south lanes, respectively. This information is still utilized as current, as no follow up studies have been conducted.

Once outside the Golden Gate, limited information is available on vessel routes once they leave the traffic lanes. Table 4.1-5 presents information on possible tanker origins and destinations, and travel distances from the California coastline when calling at terminals in the San Francisco Bay. Tankers essentially remain at least 50 miles offshore when transiting to and from Alaska, and 25 miles when transiting to and from other locations. Tank barges normally transit at least 15 miles offshore. Vessel calls to marine terminals in San Francisco Bay are shown in Table 4.1-6.

Imported cargo and associated vessel calls are expected to triple from 1995 to 2020 (LTMS 1998). Numbers taken from the Seaport Plan (BCDC and MTC 1997) show a projected increase from approximately 15 million metric tons to 44 million metric tons during this timeframe. These numbers reflect general cargo ports and terminals; commodities handled at proprietary terminals (including the Long Wharf) are not included in these projections.

Table 4.1-5
Tanker Original/Destination to/from San Francisco Bay And Distance Traveled from Coast

Origin	Destination	Typical Distance From Coast (Miles)
Alaska	SF Bay	50+
Canada	SF Bay	25+
Oregon and Washington	SF Bay	25+
Asia and Hawaii	SF Bay	NA
Los Angeles	SF Bay	25+
Mexico, Panama, and South America	SF Bay	10+
SF Bay	Oregon and Washington	25+
SF Bay	Humboldt Bay	25+
SF Bay	Asia and Hawaii	NA
SF Bay	Port San Luis	10+
SF Bay	Los Angeles	50+ ANS crude 25+ other crude and products
SF Bay	Mexico, Panama, and South America	25+

Sources: USCG and NOAA, undated. Report to Congress on Regulating Vessel Traffic in the Monterey Bay National Marine Sanctuary as Required by Public Laws 102-368 and 102-587. San Francisco Bay Region Marine Exchange, 2002.

Table 4.1-6
Vessel Calls to Marine Terminals in the San Francisco Bay During 2004

Marine Terminal	Vessels	Barges	Total
Shell Oil, Martinez	55	122	177
G.P. Resources	0	6	6
Tesoro Amorco	88	0	88
Tesoro Avon	41	87	128
Conoco/Phillips, Rodeo	26	232	258
Shore, Martinez	50	143	193
Shore, Crockett	24	31	55
Chevron Long Wharf, Richmond	368	398	770
BP West Coast, Richmond	1	22	23
Shore, Richmond	3	343	346
BP Lubricants	0	12	12
Kinder Morgan, Richmond	18	0	18
IMTT, Richmond	26	451	604
Conoco/Phillips, Richmond	0	31	31
Valero, Benicia	96	69	164
Total all Terminals	796	1,947	2,873

Total includes 127 tugs not included in the vessels or barges categories
Source: CSLC, Marine Facilities Division, 2005.

Vulnerable Resources

Vulnerable resources are those resources that could potentially be harmed by an accident or spill. Biological and water quality resources are addressed in Sections 4.2, Water Quality, and 4.3, Biological Resources. Besides commercial vessel traffic in the Bay, a great deal of fishing and recreational boating traffic occurs, as well as ferry service. There were approximately 88,500 ferry/passenger vessel trips in the Bay Area in 2000 transporting approximately 6 million passengers (URS 2002). Currently there are approximately 6,200 ferry trips per month (Harbor Safety Committee 2005). There were approximately 16,500 boat berths in San Francisco Bay marinas in 2001 (URS 2002). Fishing and recreational boating are discussed in Section 4.4, Commercial and Sports Fisheries.

Bay Area and Long Wharf Oil Spill Response Capability

Bay Area

All of the marine terminals and all vessels calling at the marine terminals are required to have oil spill response plans and a certain level of initial response capability. However, it is not economically feasible or practical for terminal operators and vessels to each have their own equipment to respond to more than minor spills. Therefore, operators must rely on pooled or contract capabilities.

The vessel and terminal owners use various companies and organizations to provide their response capability. The United States Coast Guard (USCG) has created the Oil Spill Removal Organization (OSRO) classification program so that facility and tank vessel operators can contract with and list an OSRO in their response plans in lieu of providing extensive lists of response resources to show that the listed organization can meet the response requirements. Organizations that want to receive a Coast Guard OSRO classification submit an extensive list of their resources and capabilities to the Coast Guard for evaluation. The State of California has a similar OSRO classification program to allow facility and tank vessel operators to list OSROs in meeting State oil spill response requirements. OSROs currently listed in the Bay Area that provide on water services include National Response Corp. (NRC), CBI, Marine Spill Response Corporation (MSRC), and Foss Environmental Services.

Clean Bay, an oil spill cooperative that was established for the Bay and outer coast areas, merged with MSRC on January 1, 2004. The MSRC is the largest, dedicated, standby oil spill response program in the United States, including open water, shoreline, and mid-continent river operations. MSRC response services are available to all Marine Preservation Association (MPA) members, companies that have contracted with MSRC, and on a reimbursable basis.

MSRC has an extensive inventory of response equipment located throughout the Bay Area including Berkeley, Concord, Crockett, Marin, Martinez, Oakland, Pittsburgh, Redwood City, Richmond, San Francisco (Pier 50), and Sausalito. Equipment located at Richmond is listed in Table 4.1-7.

Table 4.1-7
Equipment at Richmond California
Pacific Responder – Clean Bay 1

Skimmers		
No.	**Type**	**Effective Daily Recovery Capacity BBL/Day**
2	GT-185	2,742
1	Transrec 350	10,567
1	Stress I Skimmer	15,840
1	WP-1	3,017
1	W-1	1,920
1	GT-185	1,368
3	DOP-250	9,051

Boom		Vessels	
Feet	**Type**	**No.**	**Type**
5,940	Sea Sentry II	1	4,000 Barrel OSRV Storage
10,000	Texa Boom	1	45,000 Barrel offshore barge
9,600	Slickbar Boom	15	500 bbl Towable Storage Bladders
675	Oil Trawl	2	3,000 bb Towable Storage Bladders
3,060	Simplex Boom	4	Shallow Water Barge (non self-propelled/400 bbl)
3,472	Hard Boom (24")	1	Shallow Water Push Boat
150	Amermarine (21")	2	Bow-Picker Small Boats
550	Flexy Boom (18")	1	Shallow Water Barge (self-propelled/400 bbl)
2,650	Expandi (43")	2	35 bbl Fast Tank
100	Troil (44")	4	59 bbl Towable Storage Bladders
10,100	Harbor (20")	1	29 bbl Towable Storage Bladders
2,000	Harbor (17")		1,267 bbl TS on Clean Bay 1
1,345	American (20")		15,000 GAL COREXIT 9527
100	Troil (59")		

Long Wharf

Chevron is a member of MPA and therefore, MSRC. A list of MSRC equipment located in Richmond is provided in Table 4.1-7. Chevron also maintains spill response equipment at the Long Wharf and refinery. A list of this equipment is provided in their Spill Preparedness and Emergency Response Plan (Chevron 2005).

Federal and State regulations specify response capability requirements for marine facilities. In response to these regulations, Chevron was required to submit an oil spill response manual, which included calculations to establish a WCD from the Terminal and to show how and with what assets Chevron would respond to such a spill. The size of the worst-case accident is based on the amount of oil or product that could be released from the loading/unloading lines, considering the length of time it would take to detect the release and shut down pumps and/or close valves. Worst-case releases are presented in Table 4.1-8.

Table 4.1-8
Long Wharf Worst-Case Discharge Planning Volumes

Oil Group	WCD Planning Volume (bbl)
I - Nonpersistent Oils (e.g., gasoline, diesel, methanol)	14,869
III - Persistent oils with a specific gravity between 0.85 to 0.95 (e.g., neutral lube oils, crude oil, cutter stock)	29,879
IV - Persistent oils with a specific gravity between 0.95 and 1.0 (e.g., bunker fuel oil, cutter stock)	4,056
V - Persistent oils with a specific gravity greater than 1.0 (e.g., high sulfur fuel oil)	7,310

CSLC regulations require that all onshore marine terminals, except those "subject to high velocity currents," be able to deploy a boom in a specified manner to enclose the water surface surrounding the vessel. An "onshore marine terminal subject to high velocity currents" is defined as an onshore terminal at which the maximum current velocities are 1.5 knots or greater for the majority of the days in the calendar year. The Long Wharf fits into this category. Onshore marine terminals subject to high velocity currents must provide sufficient boom appropriate to the conditions at the terminal, trained personnel, and equipment maintained in a standby condition at the berth for the duration of the entire transfer operation, so that a length of at least 600 feet of boom can be deployed within 30 minutes of a spill.

Seven sections of containment boom (approximately 3,500 feet) are installed permanently beneath the Long Wharf to prevent any released oil or product from drifting toward shore. Sections of portable boom can be connected to each end of the permanent boom to prevent oil from drifting in other directions. Chevron stores 8,300 feet of containment boom at the Long Wharf at the following locations:

- 700 feet of 18" quick-attack boom onboard 26-foot Munson (Green Boat);
- 700 feet of 19" quick-attack boom onboard 26-foot Munson (Yellow Boat);
- 400 feet of quick-attack boom onboard 22-foot Munson (Red Boat);
- 1,000 feet of 27" boom on a Reel-Pak in Berth No. 1;
- 1,000 feet of 27" boom on a Reel-Pak in Berth No. 4;
- 1,000 feet of 24" fence type boom on the A&B Berths;
- 1,000 feet of 20' boom stored in a mobile boom trailer on the A&B Berths; and
- 2,500 feet (.47 miles) of 20" boom stored at the Marine Maintenance Center located on the Main Causeway near the A&B Berths.

In addition, Chevron stores sorbent booms, sweeps, and sheets on the wharf and maintains a 23-foot Monark (White Boat), a 13.5-foot Boston Whaler, a 17-foot Boston Whaler, five 15-foot wooden workboats, and two small aluminum workboats. A list of Chevron spill response equipment stored on the wharf is contained in their Spill Preparedness and Emergency Response Plan. This Plan states that boom deployment is expected to commence within 15 minutes of spill detection, with 600 feet deployed within 30 minutes and at least 1,000 feet deployed within 1 hour.

The USCG requires that marine terminals must be able to respond to a small (50 bbls) spill with the following equipment:

- 1,000 feet of containment boom and a means of deploying it within 1 hour;
- Oil recovery devices within 2 hours; and
- Oil storage capacity for recovered oily material.

Spills from Bay Area Marine Terminals and Long Wharf

Bay Area

The CSLC has been tracking spills from marine terminals since 1992. A total of 159 spills, varying from 1 gallon (or less) to 1,092 gallons (26 bbls), occurred during the 14 years from 1992 through 2005. This equates to approximately 11 spills per year. Terminals were the responsible party for approximately 59 percent of the spills, while vessels were responsible for the remaining 41 percent.

Long Wharf

Spill history was obtained from CSLC records for 1992, when CSLC began gathering the data, through December 2005. During these 14 years, Chevron experienced 42 releases (there was one additional release near the wharf where the responsible party could not be identified) ranging in size from a 1 gallon (or less) to 42 gallons (1 bbl). A spill size listed as 1 gallon means the actual spill size is less than 1.5 gallons and in most cases was less than 1 gallon. Chevron stated in their Spill Preparedness and Emergency Response Plan that none of the spills occurring at the Terminal since 1988, the year in which detailed information is available, caused a significant impact on the environment. During that time period Chevron reported that the largest spill was 10 bbls. They also stated that three of the spills resulted in a change in Long Wharf operating procedures. Table 4.1-9 summarizes the spill history as taken from CSLC records.

Table 4.1-9
Long Wharf Spill History, 1992 Through 2005

Date	Evolution	Product Released	Amount Released (Gal)	Responsible Party	Synopsis
1/14/92	Maintenance	Oily water	1	Terminal	Vacuum truck lost suction when hose was disconnected.
4/24/92	Idle	Fuel oil	42	Terminal	Spring-loaded sample valve failed. Oil filled and overflowed containment.
5/13/92	Maintenance	Oily water	1	Terminal	Vacuum truck overflowed while receiving bilge slops. Truck gauge was defective.
7/18/92	Load/discharge	Fuel oil	20	Vessel	Sanitation piping leaked into bunker tank causing overflow.
8/7/92	Load/discharge	ANS crude	1	Vessel	Oil spilled through inert gas riser vent.
1/30/93	Load/discharge		1	Terminal	Nipple on pump broke off, spraying oil into water.
2/1/93	Idle		1	Terminal	Valve bonnet gasket leaked, drip pan had been removed.
2/12/93	Bunkering		1	Terminal	Sample line left open during bunkering.
2/25/93	Idle		1	Terminal	Temporary cap on out-of-service hydraulic system leaked.
3/7/93	Load/discharge		1	Vessel	Suspect forward port tank at fault.
3/16/93	Load/discharge		1	Vessel	Gear box on gangway motor leaked.
8/8/93	Idle		1	Terminal	Containment drip pan corroded through.
9/15/93	Load/discharge		1	Vessel	After topping off, tankerman switched tanks, did not close stripping valve, and topped-off tank continued to fill (and then some).
1/28/94	Bunkering	Fuel oil	1	Terminal	The o-ring on loading arm at Berth No. 4 was crimped when the blank was secured. Oil leaked past the o-ring and filled the plastic bag that covered the end flange and leaked into the Bay.
2/8/94	Intra terminal	Oily water	1	Terminal	While water washing a fuel pipeline, a leak occurred at a blind flange. The bolts were not tightened enough. They were preparing the pipeline for a hydro-test.

Table 4.1-9 (continued)
Long Wharf Spill History, 1992 Through 2005

Date	Evolution	Product Released	Amount Released (Gal)	Responsible Party	Synopsis
4/14/94	Idle	Lube oil	1	Terminal	A crane leaked oil through gear box gasket. The leaking hose was disconnected and plugged. The plug was not tightened properly and during hoisting the hose, the contents drained into the water between the shipside and the dock.
8/6/94	Load/discharge	Fuel oil	1	Terminal	While loading the vessel at Berth No. 1, a loading arm leaked oil through a chicksan joint onto the vessel.
9/25/94	Testing	Oily water	1	Terminal	Testing
11/1/94	Load/discharge	Cat feed	1	Terminal	While discharging at Berth No. 1, top seal in chicksan joint began leaking and oil fell onto the ship/dock. As a result, the Preventative Maintenance Procedure was changed to ensure that proper gasketing material is installed on DCMA's used in hot oil service.
1/20/95	Load/discharge		1	Vessel	Small leak in stern tube, repaired after discharge.
5/26/95	Load/discharge	Gasoline	5	Vessel	
5/29/95	Load/discharge		1	Vessel	Oil sprayed from crane during operation.
9/19/95	Intraterminal	Cutter stock	21	Terminal	Containment pan had pinhole leak.
11/5/95	Other	Slop oil	1	Terminal	While hydrotesting, the slop line drain plug popped out.
1/17/96	Load/discharge	Gasoline	1	Vessel	Pinhole leak on shell plating. Tank No. 1 starboard.
12/1/96	Load/discharge	Crude oil	5	Vessel	Flange gasket on cargo line failed and oil spilled on the main deck. The scupper was plugged, but due to heavy rain, some oil spilled overside into the water. Personnel on board were not aware of the gasket failure for some time.

Table 4.1-9 (continued)
Long Wharf Spill History, 1992 Through 2005

Date	Evolution	Product Released	Amount Released (Gal)	Responsible Party	Synopsis
12/17/96	Maintenance	Hydraulic oil	1	Terminal	While carrying out maintenance on the vapor recovery hose, a hydraulic oil line on the crane burst releasing hydraulic oil on the dock and into the water. Most of the hydraulic oil was contained on the dock.
4/19/97	Maintenance	Hydraulic oil	1	Terminal	Oil dripped from a capped hydraulic hose. Main pipeline was being hydro-tested.
6/20/97	Bunkering	Diesel	1	Vessel	During top off, valve to starboard tank not shut. Tank overflowed onto main deck and into water.
9/13/97	Bunkering	Fuel oil	1	Terminal	Gasket on shore loading arm burst.
5/7/98	Load/discharge	Jet fuel	1	Vessel	Upon completion of discharge operations, the vessel was stripping the deck lines using a Wilden air pump. The Wilden pump discharge line runs from the vessel to the dock and was attached to a drain line on the dock
7/1/98	Intra Terminal	Oil	10	Terminal	
8/20/98	Other	Crude oil	1	Vessel	The blank flanges on the manifold valves were removed by the crew on the main deck. The chief officer in the cargo control room was opening the MOVs in the cargo transfer system to release the excess pressure built up in the cargo line system. The designated tank into which the excess pressure was to be released was No. 4 center. As soon as the header MOV was opened on deck, a large amount of oil spray mixture was expelled from the manifold on deck and overside into the water.

Table 4.1-9 (continued)
Long Wharf Spill History, 1992 Through 2005

Date	Evolution	Product Released	Amount Released (Gal)	Responsible Party	Synopsis
1/31/99	Load/discharge	Crude oil	2	Terminal	Drain valve on loading arm left open by TPIC. Oil leaked out open drain valve, filling containment area, pipelines leading to drain tank were blocked, oil spilled from containment into water. As a result, procedures for pre-arrival testing of loading arms was changed.
2/11/00	Other	Hydraulic oil	2	Vessel	Stern tube leaked from T/V Panther while transferring cargo at the wharf.
5/13/00	Load/discharge	Lube oil	1	Vessel	During topping up operations, the tanker men were not on station. The barge was topping off tanks and the tanker men misjudged the time to top off the first tank. No one was in the vicinity of the cargo tank when the spill occurred.
8/31/00		Oil	1	Other	An orphan spill in the vicinity of the Long Wharf. Chevron initiated the clean up. No responsible party identified.
2/22/01	Load/discharge	Cutter stock	1	Terminal	
10/1/01	Idle	Cutter stock	1	Terminal	Leakage from static pipeline, possibly due to thermal expansion coupled with failure of pipeline due to corrosion or other defect.
3/3/04	Load/discharge	Additives	1	Terminal	Leakage from pinhole in bypass line probably due to a manufacturing defect.
3/23/04	Idle	Cutter stock	1	Terminal	A small crack in the weld of the drip pan caused the residue to leak out of the drip pan into the water.
5/21/04	Other	Diesel	1	Vessel	Prior to and during arrival at berth, vessel was attempting to start inert gas system. Failure to ignite sent diesel fuel overboard via scrubber circulating line.

Note: Spills listed as 1 gallon are less than 1.5 gal and include spills less than 1 gal.
Source: CSLC 1999, 2002, 2006.

During the period covered by the CSLC spill records, there were a total of 159 releases from marine terminals operating in the Bay Area. This equates to approximately 1 release every 247 vessel calls. The 42 releases occurring at the Long Wharf equate to approximately 1 release every 243 vessel calls, essentially the same as the overall Bay terminal average. The Bay Area spill rates are based on the assumption that the annual number of tank vessel calls to marine terminals in the Bay Area from 1992 through 2005 has remained about the same in later years, approximately 2,800 tank vessel calls per year. This is based on data contained in Appendix C of the Unocal San Francisco Refinery Marine Terminal EIR (Chambers Group 1994), which showed the number of tank vessel calls in 1992 was 2,871, and the CSLC data, which showed that there were 2,738 tank vessel calls in 1998 and 2,873 tank vessel calls in 2004.

Major Vessel Incidents

Over the past 30 years, several incidents involving vessels have drawn public attention. In 1971, a collision of the Oregon Standard and the Arizona Standard under the Golden Gate occurred in heavy fog and resulted in the spillage of approximately 27,600 bbls of bunker heavy fuel oil. Spilled oil impacted the outer coast to the north as far as Double Point (north of Point Reyes Bird Observatory) in Marin County, and to the south near San Gregorio Beach in San Mateo County, as well as within San Francisco Bay. Approximately 4,000 seabirds died as a result of the spill. This incident led to the Bridge to Bridge Radiotelephone Act, which requires all vessels to monitor Channel 14 VHF-FM.

The chemical tanker Puerto Rican experienced an explosion in one of the void spaces surrounding a cargo tank in 1984. This incident resulted in injury to crew members as well as a release of between 25,000 and 35,000 bbls of lubricating oil and bunker fuel oil. The released oil passed through the entire north-south extent of the Gulf of Farallones National Marine Sanctuary impacting the Farallon Islands, Point Reyes, and Bodega Bay. An estimated 2,900 seabirds died as a result of this spill.

In 1989, the tug Standard IV with an oil barge in tow lost control while approaching its berth at the Richmond Long Wharf. The barge struck the pier, destroying a catwalk and parting the bowlines on the tanker "Overseas Juneau." The tanker's bow began to swing away from the pier. The tanker dropped an anchor and hailed a passing light tug. The tug held the tanker's bow against the dock while it made preparations to get underway. The tanker transited to anchorage without any further damage. The barge suffered minor damage and the tug none.

The partially laden T/V Overseas Philadelphia was moored portside at the Wickland Selby marine oil terminal during the afternoon hours of February 20, 1997, when the vessel broke loose from her mooring lines and drifted without power into the Carquinez Strait. As a result, the terminal sustained severe damage to the fixed loading arms and the concrete wharf. Reportedly, 420 gallons of jet fuel was released into the Strait. The cause may have been due to a surge from the passing of another vessel that caused the breast lines to part and allowed the vessel to swing outward away from the dock. Since no cargo transfer operations were in process at the time of the incident, the spilled contents consisted of jet fuel remaining in the loading arms. Within approximately 8 minutes of the incident, the drifting vessel started her engines to safety secure the vessel with the port anchor approximately one nautical mile from the Wickland Selby terminal.

The Singapore-flagged Neptune Dorado was detained in San Francisco on September 24, 2000, by the USCG after port State inspections revealed safety deficiencies. The four safety deficiencies cited were two inoperative main fire pumps, a leaking starboard boiler oil settling tank, inoperative main vent blowers for the engine room, and leaking fuel oil lines to the main diesel engine. The vessel was allowed to proceed to a terminal and offload its cargo of crude oil in early October after repairs were made.

Factors Affecting Vessel Traffic Safety

This section summarizes environmental conditions described in the USCG Pilot, Volume 7, 37th Edition, 2005, the San Francisco, San Pablo and Suisun Bays Harbor Safety Plan Year 2002 (Harbor Safety Committee 2002), and San Francisco Bar Pilots Operations Guidelines for the Movement of Vessels on San Francisco Bay and Tributaries that could have an impact on vessel safety in the Bay Area. More detailed information on many of the areas can be found in the existing conditions description of other sections, e.g., detailed meteorological data can be found in Section 4.6, Air Quality.

Winds

Bay Area weather is seasonably variable with three discernible seasons, for marine purposes, as discussed below.

<u>Winter Winds</u>

Winter winds from November to February shift frequently and have a wide range of speeds depending on the procession of offshore high- and low-pressure systems. Overall, calms occur between 15 and 40 percent of the time inside the Bay, and 10 to 12 percent outside the Bay. Extreme wind conditions of 50 knots gusting to 68 knots have occurred during the winter. The strongest winds tend to come from the southeast to southwest ahead of a cold front.

<u>Spring Winds</u>

Spring tends to be the windiest season, with average speeds in the Bay of 6 to 12 knots. Extremes are less likely than during the winter, but wind speeds from 17 to 28 knots occur up to 10 percent of the time. The approaches to the Golden Gate receive heavier weather and may experience 17- to 28-knot winds up to 40 percent of the time. Wind direction stabilizes as the Pacific High Pressure System becomes the dominant weather influence. Northwesterly winds are generated and reinforced by the sea breeze. Inside the Bay, winds are channeled and vary from northwest to southeast.

Summer Winds

Summer winds are the most constant and predictable. The winds outside the Golden Gate are normally from northwest to north and are generated by the strong Pacific High. This condition lasts through October until the system weakens and the winter cycle starts again. Winds inside the Bay are local depending on the land contours acting on the onshore flow. One of the few occurrences that will alter this pattern is when a high-pressure system settles over Washington and Oregon. When that happens, a northeast flow develops, bringing warm, dry air with it. This will clear away the summer fog, but also will dry the landscape and increase fire dangers.

Fog

Fog is a well-known weather condition in the Bay Area, particularly around the Golden Gate. It is most common during the summer, occasional during fall and winter, and infrequent during spring. The long-term fluctuations are not predictable, but daily and seasonal cycles are.

Summer Fog

Summer fog depends on several conditions. The Pacific High becomes well established off the coast and maintains a constant northwest wind. It also drives the cold California Current south and causes an upwelling of cold water along the coast. Air closest to the surface becomes chilled so that the temperature increases with altitude. This forms an inversion layer at about 500 to 1,500 feet (.28 miles). Moist, warm ocean air moving toward the coast is cooled first by the California Current, then more by cold coastal water. Condensation occurs and fog will form to the height of the inversion layer. This happens often enough to form a semi-permanent fog bank off the Golden Gate during the summer. Under normal summer conditions, a daily cycle is evident. A sheet of fog forms off the Golden Gate headlands during the morning and becomes more extensive as the day passes. As the temperatures in the inland valleys rise, a local low-pressure area is created, and a steady indraft takes place. By late afternoon, the fog begins to move through the Golden Gate at a speed of about 14 knots on the afternoon sea breeze. Once inside the Bay, it is carried by local winds. In general, the north part of the Bay is the last to be enveloped and the first to clear in the morning. The flow is so strong at times that the sea fog penetrates as far east as Sacramento and Stockton. If it continues for a few days, cooler ocean air replaces the warm valley air and causes the sea breeze mechanism to break down. Winds diminish and the Bay Area clears for a few days. Slowly the valley reheats and starts the cycle again.

Winter Fog

Winter fog is usually radiation fog or "tule" fog. With clear skies and light winds, land temperature drops rapidly at night. In low, damp places, such as the Delta and Central Valley (where tules and marsh plants grow), it results in a shallow radiation fog (moist sea air reacting to cold land mass) that may be quite dense. In contrast to the summer fog that moves from sea to land at about 14 knots, the winter tule fogs move slowly seaward at about 1 knot.

Currents

The currents at the entrance to San Francisco Bay are variable, uncertain, and at times attain considerable velocity. Immediately outside the bar is a slight current to the north and west known as the Coast Eddy Current. The currents that have the greatest effect on navigation in the Bay and out through the Golden Gate are tidal in nature.

In the Golden Gate, the flood or incoming current sets (direction of flow) straight in (east) with a slight tendency to the north shores, and with heavy turbulence at both Lime and Fort Points when the flood is strong. This causes an eddy or circular current between Point Lobos and Fort Point.

The ebb or outgoing current has been known to reach more than 6.5 knots between Lime and Fort Points. Its general set is westward. As with the flood current, it causes eddies between Point Lobos and Fort Point. A heavy rip and turbulence extend to a 0.25 mile south of Point Bonita.

In the Golden Gate, the maximum flood current occurs about 1.5 hours before high water, with the maximum ebb occurring about 1.5 hours before low water. The average current velocities are 3 knots for the flood and 3.5 knots for the ebb.

The flood sets to the northeast and causes swirls and eddies. This is most pronounced between the Golden Gate, Angel Island, and Alcatraz Island. The current sets through Raccoon Strait (north of Angel Island), taking the most direct path to the upper Bay and the Delta area. The ebb current inside the Golden Gate is felt on the south shore first. The duration of the ebb is somewhat longer than the flood due to the addition of runoff from the Sacramento and San Joaquin River systems.

Tides

Tides in the San Francisco Bay Area are mixed. Usually two cycles of high and low tides occur daily, but with inequality of the heights of the two. Occasionally, the tidal cycle will become diurnal (only one cycle of tide in a day). As a result, depths in the Bay are based on mean lower water level (MLLW), which is the average height of the lower of the two daily low tides. The mean range of the tide at the Golden Gate is 4.1 feet, with a diurnal range of 5.8 feet. During the periodic maximum tidal variations, the range may reach as much as 9 feet and have lowest low waters 2.5 feet below MLLW datum.

Water Depths

Water depth in the Bay Area is generally shallow and subject to silting from river runoff and dredge spoil recirculation. Therefore, channel depths must be regularly maintained and shoaling must be prevented in order to accommodate deeper draft vessels. The

Corps tries to maintain the depth of the main ship channel from the Pacific Ocean into the Bay at 55 feet; however, the continual siltation creates main channel depths ranging between 49 and 55 feet. Deep draft vessels in the Bay must carefully navigate many of the main shipping channels because channel depths in some areas are barely sufficient for navigation by some modern larger vessels, especially when deeply laden. While the Corps surveys specific areas of concern on a frequent basis, recent survey charts may not show all seabed obstructions or shallow areas due to highly mobile bottoms (due to localized shoaling). In addition, recent observations indicate that manmade channels may influence tidal currents to a greater degree than earlier anticipated. Additional information on water depth and quality at the Long Wharf is found in Section 4.2, Water Quality.

Bay Area Vessel Traffic Control Systems

Navigational Description

A Traffic Separation Scheme (TSS) has been established off the entrance of San Francisco Bay. It includes three directed traffic areas, each with one-way inbound and outbound traffic lanes separated by defined separation zones, a Precautionary Area, and a pilot boat cruising area. The TSS is recommended for use by vessels approaching or departing the Bay, but is not necessarily intended for tugs, tows, or other small vessels that traditionally operate outside the usual steamer lanes or close inshore. This TSS has been adopted by the IMO. Figure 4.1-2 depicts the TSS area and navigation aids.

There are seven Regulated Navigation Areas (RNAs) in San Francisco Bay. The USCG established these RNAs in 1993 with input from the Harbor Safety Committee, based on the voluntary traffic routing measures that were previously in existence. The RNAs are codified in 46 CFR 165.1116. RNAs organize traffic flow patterns to reduce vessel congestion where maneuvering room is limited; reduce meeting, crossing, and overtaking situations between large vessels in constricted channels; and limit vessel speed. The seven RNAs are shown in Figure 4.1-3. All vessels 1,600 gross tons or more and tugs with a tow of 1,600 gross tons or more (referred to here as large vessels) navigating in the RNAs are required by the regulations to:

- Not exceed a speed of 15 knots through the water; and
- Have engine(s) ready for immediate maneuver and operate engine(s) in a control mode and on fuel that will allow for an immediate response to any engine order.

Each of the seven RNAs is described below.

4.1-2 – Offshore Traffic Separation Scheme

4.1-3 – RNAs

San Francisco Bay RNA

The San Francisco Bay RNA consists of the water area in the Golden Gate east of the COLREGS Demarcation Line (33 CFR 80.1142), the Central Bay including Racoon Strait, and the existing charted Precautionary Area east of Alcatraz Island (Figure 4.1-3). Traffic lanes have been established in this RNA to separate opposing traffic and reduce vessel congestion. Because of shoals and rocks in the Central Bay, the Central Bay Two-way Deep Water Traffic Lane (DWTL) north of Harding Rock, provides the best water depth safety margin for inbound vessels with a draft of 45 feet or greater, and for outbound vessels with a draft of 28 feet or greater. Such deep draft vessels are required to use the DWTL. All other vessels are encouraged to use the Central Bay Traffic Lanes so that vessel traffic in the DWTL is kept to a minimum. Regulations prohibit a large vessel from entering the DWTL when another large vessel is navigating therein and when either vessel is carrying certain dangerous cargo (as defined in 33 CFR 160.203), bulk petroleum products, or is a tank vessel in ballast, if such entry could result in meeting, crossing, or overtaking the other vessel.

Because vessels are converging or crossing in such a manner that one-way traffic flow patterns cannot be established, there are two Precautionary Areas in the RNA: (1) the Golden Gate Precautionary Area, which encompasses the waters around the Golden Gate between the Golden Gate and the Central Traffic Lanes; and (2) the Central Bay Precautionary Area, which encompasses the large portion of the central bay and part of the lower bay. It is recommended that all vessels navigating in these Precautionary Areas be aware of the joining lanes and DWTL so as to anticipate the movements of the other vessels.

Oakland Harbor RNA

The Oakland Harbor RNA encompasses the Oakland Bar Channel, Oakland Outer Harbor Entrance, and Middle Harbor and Inner Harbor Entrance Channels. Large vessels are prohibited from entering the RNA if they could meet, cross, or overtake another large vessel.

Southampton Shoal Channel/Richmond Harbor RNA

This RNA encompasses Southampton Shoal Channel, the Richmond Long Wharf Maneuvering Area, the Richmond Harbor Entrance Channel, and Point Potrero Reach (Figure 4.1-3). These are dredged channels and areas within which maneuvering room is severely limited. In addition, the Southampton Shoal Channel is transited by a high number of laden tank vessels, and vessels carrying dangerous cargo or bulk petroleum. The Richmond Long Wharf Maneuvering Area, between the Richmond Harbor Entrance Channel and Southampton Shoal Channel, often has vessels operating at low speeds where maneuvering is restricted. Large vessels are prohibited from entering the RNA if they could meet, cross, or overtake another large vessel.

North Ship Channel RNA and San Pablo Strait Channel RNA

Both these RNAs consist of the existing charted channels and delineate the only areas where the depths of water are sufficient to allow safe transit of large vessels. The existence of strong tidal currents in these channels severely restricts the ability of large vessels to safely maneuver to avoid smaller vessels. The general regulations apply to these areas; however, the addition of special regulations is not justified at this time.

Pinole Shoal Channel RNA

This RNA is a constricted waterway, the use of which is currently restricted to vessels and tows 1,600 gross tons or more (called large vessels). Regulations prohibit a large vessel from entering the Pinole Shoal Channel when another large vessel is navigating therein and when either vessel is carrying certain dangerous cargo, bulk petroleum products, or is a tank vessel in ballast, if such entry could result in meeting, crossing, or overtaking the other vessel.

Benicia-Martinez Railroad RNA

This RNA consists of a small circular area, 200 yards in radius, centered on the middle of the channel under the Benicia-Martinez Railroad Bridge that spans the Carquinez Strait between Benicia and Martinez. Because of the limited horizontal clearance of the bridge, large vessels are prohibited from transiting this RNA when visibility is less than 0.5 nm.

Position Reporting, Communication, and Surveillance

The USCG Vessel Traffic Center (VTC) at Yerba Buena Island is the communications center for the TSS. The TSS was extensively upgraded in 1997. The upgraded system includes state-of-the-art computer digitized radar displays shown on electronic charts. The new system automated many of the controller's duties, allowing more time for monitoring traffic.

Pilotage

Pilotage in and out of the San Francisco Bay and adjacent to the waterways is compulsory for all vessels of foreign registry and United States vessels under enrollment not having a federal licensed pilot on board. The San Francisco Bar Pilots provide pilotage to ports in San Francisco Bay and to ports on all tributaries to the Bay. Pilots board the vessels in the Pilot Boarding Area outside the Golden Gate entrance, and then pilot the vessels to their destinations. Pilots normally leave the vessels after docking and reboard the vessels when they are ready to leave and pilot them to sea or other destinations within the Bay Area.

Navy pilots operate military vessels and Military Sealift Command (MSC) vessels. The MSC vessels are normally boarded in the Pilot Boarding Area outside the Golden Gate entrance. The military vessels are boarded either outside the Golden Gate entrance or inside the Bay.

Physical Oceanographic Real Time System (PORTS)

The PORTS was installed in the Bay Area in 1995 with OSPR assuming overall responsibility for the system in 1998. The PORTS is designed to provide crucial information in real time to mariners, oil spill response teams, managers of coastal resources, and others about San Francisco Bay's water levels, currents, salinity, and winds. In partnership with NOAA, National Ocean Service (NOS), California OSPR, the USGS, and the local community, the Marine Exchange operates PORTS as a service to those who must make operational decisions based on oceanographic and meteorological conditions in the Bay. PORTS stations are located at the Golden Gate entrance, Redwood City, Alameda, Oakland, Richmond, Benicia, Port Chicago, and Grizzly Bay.

The instruments that collect the information are deployed at strategic locations in the Bay to provide data at critical locations, and to allow now casting and forecasting using a mathematical model of the Bay's oceanographic processes. Data from the sensors are fed into a central collection point; raw data from the sensors are integrated and synthesized into information and analysis products, including graphical displays of PORTS data. These displays are available over the Internet and through a voice response system. PORTS is currently experiencing severe communications problems that will require major system upgrades.

4.1.2 Regulatory Setting

Many laws and regulations are currently in place that regulate marine terminals, vessels calling at marine terminals, and emergency response/contingency planning. Responsibilities for enforcing or executing these laws and regulations fall to various international, Federal, State, and local agencies. The various agencies and their responsibilities are summarized below.

International Maritime Organization (IMO)

The major body governing the movement of goods at sea is the IMO, which does so through a series of international protocols. Individual countries must approve and adopt these protocols before they become effective. The International Convention for the Prevention of Pollution from Ships (MARPOL 73/78 and amendments) governs the movement of oil and specifies tanker construction standards and equipment requirements. Regulation 26 of Annex I of MARPOL 73/78 requires that every tanker of 150 tons gross tonnage and above shall carry on board a shipboard oil pollution emergency plan approved by IMO. The U.S. implemented MARPOL 73/78 with passage of the Act of 1980 to Prevent Pollution from Ships. The IMO (IMO 1992) has also issued "Guidelines for the Development of Shipboard Oil Pollution Emergency Plans" to assist tanker owners in preparing such plans that comply with the cited regulations and to assist governments in developing and enacting domestic laws which give force to and implement the cited regulations. Plans that meet the 1990 Oil Pollution Act (OPA 90) and the Lempert-Keene-Seastrand Oil Spill Prevention and Response Act (California SB 2040) requirements also meet IMO requirements. Traffic Separation Schemes (TSSs), must be approved by the IMO, such as the approved TSSs off the entrances to San Francisco Bay and the Santa Barbara Channel.

The IMO adopted an amendment to the International Convention for Safety of Life at Sea (SOLAS) with provisions entitled "Special Measures to Enhance Maritime Safety" which became effective in 1996. These provisions allow for operational testing during port State examinations to ensure that masters and crews for both U.S. and international vessels are familiar with essential shipboard procedures relating to ship safety. The U.S. Coast Guard (USCG) Marine Safety Office conducts these port State examinations as part of their vessel inspection program.

Federal Agencies

A number of Federal laws regulate marine terminals and vessels. These laws address, among other things, design and construction standards, operational standards, and spill prevention and cleanup. Regulations to implement these laws are contained primarily in Titles 33 (Navigation and Navigable Waters), 40 (Protection of Environment), and 46 (Shipping) of the Code of Federal Regulations (CFR). The most recent act to address spill prevention and response is OPA 90.

OPA 90 was enacted to expand prevention and preparedness activities, improve response capabilities, ensure that shippers and oil companies pay the costs of spills that do occur, and establish an expanded research and development program. The Act also established a one billion dollar Oil Spill Liability Trust Fund, funded by a tax on crude oil received at refineries. A Memorandum of Understanding (MOU) was established to divide areas of responsibility. The USCG is responsible for tank vessels and marine terminals, the Environmental Protection Agency (EPA) for tank farms, and the Research and Special Programs Administration (RSPA) for pipelines. Each of these agencies has developed regulations for their area of responsibility.

All facilities and vessels that have the potential to release oil into navigable waters are required by OPA 90 to have up-to-date oil spill response plans and to have submitted them to the appropriate Federal agency for review and approval. Of particular importance in OPA 90 is the requirement for facilities and vessels to demonstrate that they have sufficient response equipment under contract to respond to and clean up a worst-case spill.

Other key laws addressing oil pollution include:

- Federal Water Pollution Control Act of 1972;
- Clean Water Act of 1977;
- Water Quality Act of 1987;
- Act of 1980 to Prevent Pollution from Ships;
- Resource Conservation and Recovery Act (RCRA) of 1978;
- Hazardous and Solid Waste Act of 1984; and
- Refuse Act of 1899.

Responsibilities for implementing and enforcing the Federal regulations addressing terminals, vessels, and pollution control fall to a number of agencies, as described in the following sections.

United States Coast Guard (USCG)

The USCG, through Title 33 (Navigation and Navigable Waters) and Title 46 (Shipping) of the CFR, is the Federal agency responsible for vessel inspection, marine terminal operations safety, coordination of Federal responses to marine emergencies, enforcement of marine pollution statutes, marine safety (navigation aids, etc.), and operation of the National Response Center (NRC) for spill response, and is the lead agency for offshore spill response. The USCG implemented a revised vessel-boarding program in 1994 designed to identify and eliminate substandard ships from U.S. waters. The program pursues this goal by systematically targeting the relative risk of vessels and increasing the boarding frequency on high-risk (potentially substandard) vessels. Each vessel's relative risk is determined through the use of a matrix that factors the vessel's flag, owner, operator, classification society, vessel particulars, and violation history. Vessels are assigned a boarding priority from I to IV, with priority I vessels being the potentially highest risk. The USCG is also responsible for reviewing marine terminal Operations Manuals and issuing Letters of Adequacy upon approval. At the present time, the USCG relies on CSLC to review Operations Manuals and inspect terminals in the San Francisco Bay. The USCG issued regulations under OPA 90 addressing requirements for response plans for tank vessels, offshore facilities, and onshore facilities that could reasonably expect to spill oil into navigable waterways.

Because studies have shown that the use of double-hull vessels will decrease the probability of releases when tank vessels are involved in accidents, the USCG issued regulations addressing double-hull requirements for tank vessels. The regulations establish a timeline for eliminating single-hull vessels from operating in the navigable waters or the Exclusive Economic Zone of the United States after January 1, 2010, and double-bottom or double-sided vessels by January 1, 2015. Only vessels equipped with a double hull, or with an approved double containment system will be allowed to operate after those times. The phase-out timeline is a function of vessel size, age, and whether it is equipped with a single hull, double bottom, or double sides. The phase out began in 1995 with 40-year-old or older vessels equipped with single hulls between 5,000 and 30,000 gross tons, 28 year or older vessels equipped with single hulls over 30,000 gross tons, and 33 year or older vessels equipped with double bottoms or sides over 30,000 gross tons. All new tankers delivered after 1993 must be double hulled. Double-bottom or double-sided vessels can essentially operate 5 years longer than single-hull vessels.

Environmental Protection Agency (EPA)

The EPA is responsible for the National Contingency Plan and acts as the lead agency in response to an onshore spill. EPA also serves as co-chairman of the Regional Response Team, which is a team of agencies established to provide assistance and guidance to the on-scene coordinator (OSC) during the response to a spill. The EPA also regulates disposal of recovered oil and is responsible for developing regulations for Spill Prevention, Control, and Countermeasures (SPCC) Plans. SPCC Plans are required for nontransportation-related onshore and offshore facilities that have the potential to spill oil into waters of the United States or adjoining shorelines. Chevron has a current SPCC Plan (Chevron 2002).

Department of Commerce through the National Oceanic and Atmospheric Administration (NOAA)

NOAA provides scientific support for response and contingency planning, including assessments of the hazards that may be involved, predictions of movement and dispersion of oil and hazardous substances through trajectory modeling, and information on the sensitivity of coastal environments to oil and hazardous substances. They also provide expertise on living marine sources and their habitats, including endangered species, marine mammals and National Marine Sanctuary ecosystems, and information on actual and predicted meteorological, hydrological, and oceanographic conditions for marine, coastal, and inland waters, and tide and circulation data for coastal waters.

Department of the Interior (DOI)

DOI, through its various offices, provides expertise during spills in a number of areas, as described below:

- U.S. Fish and Wildlife Service (USFWS) – Anadromous and certain other fishes and wildlife, including endangered and threatened species, migratory birds, and certain marine mammals; waters and wetlands; and contaminants affecting habitat resources; and

- U.S. Geological Survey (USGS) – Geology, hydrology (groundwater and surface water), and natural hazards.

Department of Defense (DOD)

DOD, through the U.S. Army Corps of Engineers (Corps), is responsible for reviewing all aspects of a project and/or spill response activities that could affect navigation. The Corps has specialized equipment and personnel for maintaining navigation channels, removing navigation obstructions, and accomplishing structural repairs.

State Agencies

California State Lands Commission (CSLC)

Chapter 1248 of the Statutes of 1990 (SB 2040), the Lempert-Keene-Seastrand Oil Spill Prevention and Response Act, established a comprehensive approach to prevention of and response to oil spills. The CSLC Marine Facilities Division (MFD) is responsible for governing marine terminals. Through two California Code of Regulations (CCR) § 2300 through 2571, the MFD established a comprehensive program to minimize and prevent spills from occurring at marine terminals, and to minimize spill impact should one occur. These regulations established a comprehensive inspection-monitoring plan whereby CSLC inspectors monitor transfer operations on a continuing basis.

A three-phase structural inspection plan was established in June 1992 for the Long Wharf. Each phase addressed the inspection of a different section of the wharf with the goal of inspecting all components. A comprehensive structural upgrade program has been completed to improve safety during a seismic event. Section 4.11, Geological Resources/Structural Integrity Review, provides a discussion of the upgrade program. The standards generated by the Marine Oil Terminal Engineering and Maintenance Standards (MOTEMS) provide specific requirements for subsequent audits and engineering inspections.

CSLC's marine terminal regulations are similar to, but more comprehensive than, Federal regulations in the area of establishing exchange of information between the terminal and vessels, information that must be contained in the Declaration of Inspection, requirements for transfer operations, and information that must be contained in the Operations Manual. All marine terminals are required to submit updated Operations Manuals to the CSLC for review and approval. The CSLC regulations also require that prior to the commencement of transfer of persistent oil, a boom shall be deployed to contain any oil that might be released. Marine terminals subject to high velocity currents, where it may be difficult or ineffective to pre-deploy a boom, are required to provide sufficient boom, trained personnel, and equipment so that at least 600 feet of boom can be deployed for containment within 30 minutes. The Long Wharf is subject to high velocity currents.

A requirement that each marine oil terminal operator must implement a marine oil terminal security program is contained in Section 2430 of CCR Title 2, Division 3, Chapter 1, Article 5.1. At a minimum, each security program must:

- Provide for the safety and security of persons, property, and equipment on the terminal and along the dockside of vessels moored at the terminal;
- Prevent and deter the carrying of any weapon, incendiary, or explosive on or about any person inside the terminal, including within his or her personal articles;
- Prevent and deter the introduction of any weapon, incendiary, or explosive in stores or carried by persons onto the terminal or to the dockside of vessels moored at the terminal; and
- Prevent or deter unauthorized access to the terminal and to the dockside of vessels moored at the terminal.

The Marine Facilities Division has also issued regulations on the following:

- Marine Terminal Personnel Training and Certification;
- Structural Requirements for Vapor Control Systems at Marine Terminals; and
- Marine Oil Terminal Pipelines.

California Department of Fish and Game (CDFG)

The Office of Oil Spill Prevention and Response (OSPR) was created within the CDFG to adopt and implement regulations and guidelines for spill prevention, response planning, and response capability. Final regulations regarding oil spill contingency plans for vessels and marine facilities were issued in November 1993, and last updated in October 2002. These regulations are similar to, but more comprehensive than, the Federal regulations. The regulations require that tank vessels, barges, and marine facilities develop and submit their comprehensive oil spill response plans to OSPR for review and approval.

OSPR's regulations require that marine facilities and vessels be able to demonstrate that they have the necessary response capability on hand or under contract to respond to specified spill sizes, including a worst-case spill. The regulations also require that a risk and hazard analysis be conducted on each facility. This analysis must be conducted in accordance with procedures identified by the American Institute of Chemical Engineers (AIChE).

SB 2040 established financial responsibility requirements and required that Applications for Certificate of Financial Responsibility be submitted to OSPR. California's requirement for financial responsibility is in excess of the Federal requirements.

SB 2040 also requires the OSPR to develop a State Oil Spill Contingency Plan. In addition, each major harbor was directed to develop a Harbor Safety Plan addressing navigational safety, including tug escort for tankers. The Harbor Safety Committee of the San Francisco Bay Region issued its Harbor Safety Plan in 1992, and has issued annual updates since that time. The plan contains several recommendations to improve safety. One recommendation, first implemented in May 1993 through OSPR issuance of the then interim regulations (now permanent), requires that all tank vessels carrying more than 5,000 tons of oil have available a standby tug or be escorted by one or more tugs when transiting through certain zones, as shown in Figure 4.1-1. As can be seen from Figure 4.1-1, tug escorts are required while tankers are transiting from the mouth of the Bay to the Long Wharf.

California Coastal Commission (CCC)

The CCC and the San Francisco Bay Conservation and Development Commission (BCDC) have oil spill statutory authority under the following two statutes: California Coastal Act of 1976 and Lempert-Keene-Seastrand Oil Spill Prevention and Response Act of 1990. The CCC responsibilities include all of California's coastal shoreline, including ports and harbors, except for the San Francisco Bay, which falls under the jurisdiction of the BCDC. Responsibilities include:

- Review of coastal development projects related to energy and oil infrastructure for compliance with the Coastal Act and consistency with the Coastal Zone Management Act;

- Attendance at statewide and regional Harbor Safety Committee Area committee and subcommittee meetings, e.g., dispersants, sensitive sites, Area Contingency Plan update, oiled wildlife operations;

- Review of regulations for oil spill prevention and response, and input on these regulations' consistency with Coastal Act regulations and policies;

- Review of oil spill contingency plans for marine facilities located in the coastal zone/Bay Area, and oil spill response plans for facilities located on the outer continental shelf;

- Participation in the State Interagency Oil Spill Committee (SIOSC), SIOSC Review Subcommittee, and Oil Spill Technical Advisory Committee meetings and assignments;

- Participation in studies that will improve oil spill prevention, response, and habitat restoration;

- Participation in oil spill drills; and

- Participation in the development of planning materials for oiled wildlife rehabilitation facilities.

4.1.3 Significance Criteria

A public safety impact is considered significant if any of the following apply:

- There is a potential for fires, explosions, releases of flammable or toxic materials, or other accidents from the terminal or from vessels calling at the terminal that could cause injury or death to members of the public;

- The existing facility does not conform to its oil spill contingency plans or other plans that are in effect or if current or future operations are not consistent with Federal, State, or local regulations. Conformance with regulations does not necessarily mean that there are not significant impacts; or

- Existing and proposed emergency response capabilities are not adequate to effectively mitigate spills and other accident conditions.

The potential for oil or product spills is discussed in this section; however, the potential impact from spills is analyzed in the other resource-related sections, e.g., marine biology, water quality, fisheries, land and recreation uses.

Approach to Analyzing Impacts of Upset Conditions

System safety/risk-of-upset impact significance criteria are more difficult to define than those of other environmental issue areas because an accident must occur before an impact can occur. The expected frequency of accidents must be factored into the definition, and to complicate the matter, just because an accident occurs does not mean significant impacts will result. Thus, system safety/risk-of-upset considers both: (1) spills that can potentially impact the environment, and (2) incidents that can potentially impact the safety of the public.

The expected frequency of spills occurring as a function of volume was estimated, as was the extent of area that may be impacted by these spills using available oil spill trajectory modeling results. Note that a spill itself does not necessarily impact the environment unless specific resources are impacted. How a spill impacts the environment is addressed in the other resources sections of this EIR, including Section 4.3, Biological Resources, Section 4.4, Commercial and Sports Fisheries, Section 4.5, Land Use/Recreation, and Section 4.9, Visual Resources/Light and Glare. Any deficiency in Chevron's ability to respond to upset conditions and the potential for impacts to public safety is assessed.

For incidents that may impact public safety, the expected frequency versus severity of consequences matrix (Figure 4.1-4) was used to determine the level of significance. This concept classifies expected frequency of occurrence into five categories (frequent, likely, unlikely, rare, and extraordinary) based on a predefined expected level of occurrence. Severity of consequence is also classified into five categories (negligible, minor, major, severe, and disastrous) based on the potential safety impact on the public. Potential impacts to the public have been determined by calculating applicable "hazard footprints" for the type of accidents that can potentially occur. Types of hazard footprints that have been calculated include radiant heat from a fire, flammable gas cloud from a release, and blast overpressure and flying debris from an explosion. Figure 4.1-4 presents the significance criteria matrix for hazard footprints. Incidents that fall in the shaded area of the matrix would be classified as significant.

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		SEVERITY OF CONSEQUENCE				
		Negligible: No Significant risk to the public, with no minor injuries	Minor: Small level of public risk, with at most a few minor injuries	Major: Major level of public risk with up to 10 severe injuries	Severe: Severe public risk with up to 100 severe injuries or up to 10 fatalities	Disastrous: Disastrous public risk involving more than 100 severe injuries or more than 10 fatalities
FREQUENCY OF OCCURRENCE	Frequent: Greater than once a year					
	Likely: Between once a year and once in one hundred years					
	Unlikely: Between once in a hundred and once in ten thousand years					
	Rare: Between once in ten thousand years and once in a million years					
	Extraordinary: Less than once in a million years					

Defined as significant impacts

Source: County of Santa Barbara Department of Resource Management, Environmental Thresholds & Guidelines Manual, Amended 1995.

Chambers Group

SEVERITY OF CONSEQUENCES MATRIX
Figure 4.1-4

The analysis of the proposed Project quantifies the probability of an accident due to the project from both the tank vessel traffic and the terminal. The analysis considers the specific type, e.g., tankers, barges, and number of vessels that will be calling at the terminal over the lease period, specific design features of the terminal, and the historical accident record. Information regarding potential hazards during vessel approaches and departures is evaluated based on historical data, interviews with people knowledgeable of the area, and information that may be available from the Harbor Safety Committee.

Terminal design is analyzed in Section 4.11, Geotechnical Resources/Structural Integrity Review, based on information provided by Chevron and the CSLC Marine Facilities Division (inspections performed). This risk/safety analysis has been performed to help determine what types of incidents can occur at the terminal, the consequences of the incidents, and their expected frequency of occurrence. All aspects of the terminal and terminal operations have been addressed, including the loading hoses/arms, the pipelines between the wharf and the refinery/storage tanks, the vapor collection system, the wharf drainage system, and the wharf itself. Seismic stresses are also addressed. The worst case and most likely spill sizes that could occur from the various components of the terminal have been estimated. Some of this information, including a worst-case spill and risk and hazard analysis, is provided in the Chevron Spill Preparedness and Emergency Response Plan approved by the OSPR. Chevron's ability to respond and mitigate potential incidents has also been evaluated.

4.1.4 Impacts Analysis and Mitigation Measures

4.1.4.1 Spill Response Capability and Potential for Public Risk at the Long Wharf

Impact OS-1: Wharf Deck Drainage System

There are no deficiencies with the existing deck drainage system or procedures that could pose a risk for, or increase the potential for spills at the terminal from routine operations. However, small spills are still possible. Impacts are adverse, but less than significant (Class III).

The transfer area of each berth is impounded by a raised berm. Drip pans are located under all piping manifolds at the berth areas and are designed to collect potential drips from bolted flanges, fittings, and expansion joints. A description of the drip and recovered oil facilities and oil/product transfer procedures is contained in the project description in Section 2.3.3, Operational Procedures. The emergency shutdown system is also described in Section 2.3.3, Operational Procedures, with activation of the emergency shutdown system able to close the pipeline block valves within 60 seconds.

Based on analysis of the Wharf Operations Manual and the terminal spill history, and on the Chambers Group site visit, no significant deficiencies with the existing transfer equipment or procedures would pose a risk for, or increase the potential for spills at the terminal. However, small spills are still possible and, as shown by the spill history, several small non-significant spills have occurred since 1992. Based on the above, impacts from routine operations are considered adverse, but less than significant (Class III).

<u>OS-1: No mitigation is required</u>.

Impact OS-2: Potential Impacts from Gasoline and Other Highly Volatile Product Releases

Potential impacts to public safety from a highly volatile product release are adverse, but less than significant (Class III) since the vapors evaporate quickly.

Highly volatile products such as gasoline are highly flammable and evaporate rather quickly. If ignited, the vapors could result in a flammable vapor cloud, which would disperse quickly, and would not present a flammable or toxic gas cloud to nearby communities. Because they are so volatile and easily ignited, Chevron states in their Spill Preparedness and Emergency Response Plan that, to avoid ignition, boom should not be deployed in the vicinity of a highly volatile product spill, even though the highly volatile products are lighter than water and float, and may travel some distance from the pool. The standard response to a highly volatile product spill is to stop the source of the spill, keep vessel and other marine traffic away from the pool to prevent ignition, and wait until the product evaporates until there is no ignition hazard.

The response method is acceptable to the USCG, and no additional response is required. The potential for impacts to water quality and biological resources are discussed in Sections 4.2, Water Quality, and 4.3, Biological Resources, respectively.

OS-2: No mitigation is required.

Impact OS-3: Potential for Spills and Response Capability for Containment of Class I-IV Oil Spills from Terminal during Transfer Operations.

Chevron's response capability for containment of spills during transfer operations would result in adverse and significant impacts for spills greater than 50 bbls. Consequences would range from spills that can be contained during first response efforts with rapid cleanup (Class II), to those complex spills that result in a significant impact (Class I) with residual effects after mitigation.

Potential for Spills from the Terminal

Spills may originate from the Long Wharf or from the vessel and may be due to natural factors (earthquake), human error (berth collision, bad hose connection), or deterioration. Potential sources of a spill from the Terminal include drip pans, hydraulic hoses, loading hoses and fittings, pipelines and fittings, and valves. As discussed in Section 4.11, Geological Resources/Structural Integrity Review, the seismic upgrade program reduced potentially significant, adverse impacts of a pipeline rupture to a less than significant level (Class III) and no further mitigation is required. Thus, spills during transfer operations are the focus of this discussion.

A release from a vessel while at the Terminal is also possible. As a worst case, the entire contents of a vessel could be released; however, this is not considered a realistic scenario. The CSLC spill database (See Section 4.1.1, Environmental Setting, and Table 4.1-9) differentiates between spills from the Terminal and spills from the vessel at the Terminal. As a comparison to the data in the table, the largest release from a tank vessel (all tank vessels, not just those calling at the Long Wharf) in the Bay during the 1992-2004 time period was 420 gallons (10 bbls).

Spill Planning Volumes

EPA, USCG, and CSLC have specified methods for calculating three levels of spill planning volumes for use in determining the minimum amount of spill response equipment/capability that must be available within specified times frames to respond to the release. These are discussed below.

Reasonable Worst Case Discharge (WCD)

WCD volumes are presented in Table 4.1-8, near the beginning of this section. The largest WCD is 29,879 bbls of Group III oil.

Maximum Most Probable (Medium) Discharge

The USCG defines this discharge as the lesser of 1,200 bbls or 10 percent of the volume of the WCD. The WCD is 29,879 bbls and thus, the maximum most probable discharge is 583 bbl.

Average Most Probable (Small) Discharge

EPA defines the average most probable discharge as 50 bbls, not to exceed the WCD while the USCG defines it to be the lesser of 50 bbls or 1 percent of the WCD (299 bbls in this case). Thus, the average most probable (small) discharge planning volume is 50 bbls.

Probability of Release

Probability of Spills from the Long Wharf

The CSLC spill data, augmented by additional data for larger spills, were used to estimate the probability of spills from the Long Wharf. The average number of vessel calls in the Bay over the past 14 years has been approximately 2,800 per year; this results in a probability of a spill per vessel call of 4.1×10^{-3}. The largest spill during the 14-year period was 26 bbls (1,092 gallons). While the probability of a spill is presented in terms of spills per vessel transfer, the database includes spills that occur even when a vessel is not present. However, the vast majority of spills occur when vessels are present and it is generally felt that including other spills in the calculations does not bias the results. Therefore, the cited probability reflects the probability of spills at the Long Wharf from all causes and not just those associated with transfer operations.

To estimate the probability of a spill greater than 26 bbls, worldwide data were used. Based on the review of the various components of the Long Wharf discussed above, it is believed that spill statistics for marine terminals worldwide can be used to estimate the potential for a large spill from the Long Wharf.

Aspen Environmental Group (1992) estimated that the "at-pier" spill rate for spills greater than 1,000 bbls (about 42,000 gallons) is 0.95 spills per 10,000 port calls for tankers worldwide. Because of the safety record of the San Francisco Bay Area, Aspen applied a 0.4 historical modifier to the worldwide spill rate, resulting in a spill rate estimate of 0.38 spills greater than 1,000 bbls per 10,000 port calls (3.8×10^{-5} spills per port call). The spill rate for tankers involved in Alaskan crude trade is 0.44 spills greater than 1,000 bbls per 10,000 port calls, similar to the modified Bay Area estimate.

To estimate the probability of smaller size spills of 238 bbls (10,000 gallons), information on spills occurring between 1978 and 1988 published by Cutter Information Corporation (1989) was analyzed. Based on this database, the probability of spills greater than 238 bbls at marine terminals in the Bay Area is estimated to be 2.7×10^{-4}. CSLC records show that there were 765 vessel calls at the Long Wharf in 2004. The following estimated spill frequencies are based on 900 vessel calls per year, the maximum that Chevron projects over the 30-year lease period.

Based on these data, an average of about four spills per year can be expected from the Long Wharf. Of these, 2 to 3 would be less than 1 gallon. The probability of a spill larger than 23.8 bbls (1,000 gallons) from the Terminal is 22 percent or 1 spill every 4 to 5 years. During the past 12 years, there has been 1 spill greater than 23.8 bbls (1,000 gallons) from a marine terminal in the Bay Area. The annual probability of a spill greater than 1,000 bbls (42,000 gallons) from the Long Wharf is 3.4 percent. This equates to an expected mean time between spills of 29 years. Over a 30-year lease, there would be a 64 percent probability that a spill (one or more) greater than 1,000 bbls (42,000 gallons) would occur. The probability of a spill greater than 1,000 bbls (42,000 gallons) in 30 years is determined by calculating the probability of no spills in 30 years which is equal to the probability of no spills in a single year (1-0.034 = 0.966) raised to the thirtieth power ($0.966^{30} = 0.354$) and then subtracting this from 1 (1 – 0.354 = 0.64). The probability of a spill (one or more) in a given time period is equal to one minus the probability of no spills in that time period.

The consequences of a spill would depend on the size of the spill, the effectiveness of the response effort, and the biological, commercial fishery, shoreline, and other resources affected by the spill. A spill of 1 gallon or less would result in an adverse impact that can be mitigated, while a large spill of 1,000 bbls (42,000 gallons) most likely would result in a significant, adverse impact that would have residual effects after mitigation. The impacts of spills between 1 gallon and 1,000 bbls (42,000 gallons) depend on the effectiveness of response efforts and the resources impacted. An analysis of the Long Wharf's oil spill response capabilities is presented below. The impacts of a release on other resources are addressed in the other subsections of Section 4, Existing Environment and Impacts Analysis.

Response Capability

Chevron's response assets are described in Section 4.1.1, Environmental Setting. The following describes the steps Chevron would most likely follow in the event of a spill and the potential effectiveness of the response. The responses described below are for releases of Group III or IV crude oils and persistent products. Response to releases of flammable products, that is those with flash points below 100°F such as gasoline, would consist primarily of ignition control and is described in Impact OS-2 above. Reponses to Group V oils would be different because these materials are heavier than water and do not stay on the surface. Group V oil spill response is presented in Impact OS-4 below.

Chevron's first step upon discovering a release of a Group III or IV oil would be to attempt to stop it, e.g., activate emergency shutdown system. Chevron would then activate their spill response team. This would include the personnel on duty at the Long Wharf and spill response personnel at the Refinery. The next step would most likely be to deploy the boom on the Long Wharf. This deployable boom would be connected to the permanently installed boom. Chevron maintains a minimum of two spill response boats, at least one of which is capable of deploying boom at the Long Wharf. The boom would be deployed on the down-current side of the spill in an attempt to prevent the oil from drifting away. Additional fast response vessels, boom carrying/deploying vessels, boom, personnel, and other response equipment are available from MSRC. The current itself would assist in deploying the boom in the shape of a catenary curve. Oil would be recovered with sorbent material and/or skimmers. As stated above, Chevron maintains sorbent material at the Long Wharf. Numerous skimming vessels and additional sorbent material are available from MSRC. Clean Bay I, a 140-foot oil spill response vessel, is berthed in Richmond Inner Harbor and staffed 24 hours a day. MSRC can also supply oil storage devices to collect the recovered oil. Even through Chevron is compliant with USCG regulations for spill response for responding to a small (50 bbls) spill, there are additional protective measures available that can be applied to maximize protection against accidental spills and damage to either the wharf or vessel, thus without these measures impacts are significant for small spills (Class II). Impacts of larger spills that cannot be contained may remain significant (Class I). However the effects of a small spill may still result in a significant adverse impact as identified in other resources sections (4.2, Water Quality, 4.3, Biological Resources, and 4.4, Commercial and Sport Fisheries) of this DEIR.

Mitigation Measures for OS-3: The following shall be completed by Chevron within 12 months of lease implementation, unless otherwise specified.

OS-3a. Provide quick release devices that would allow a vessel to leave the wharf as quickly as possible in the event of an emergency (fire, accident, or tsunami that could lead to a spill) that could impact the wharf or the vessel.

OS-3b. Install tension-monitoring devices at Berth 1 to monitor mooring lines and avoid excessive tension or slack conditions that could result in spills. An alarm system (visual and sound) that incorporates communication to the control-building operator shall also be a part of the system. In addition, if any vessel drifts (surge or sway) more than 7 feet from its normal manifold or loading arm position at any other terminal berth, Chevron shall install, within 6 months after the incident, tension-monitoring devices at such berth.

OS-3c. Install Allision Avoidance System (AAS) at the terminal to prevent damage to the pier and/or vessel during docking operations. Prior to implementing this measure, Chevron shall consult with the San Francisco Bar Pilots, the U.S Coast Guard, and the staff of the CSLC and provide information that would allow the CSLC to determine, on the basis of such consultations and information regarding the nature, extent and adequacy of the existing berthing system, the most appropriate application and timing of an AAS at the Chevron Long Wharf.

OS-3d. Develop a comprehensive preventative maintenance program that includes periodic inspection of all components related to transfer operations. The program shall be subject to California State Lands Commission review and approval.

Rationale for Mitigation: The wharf currently has no mechanisms that would allow the quick release of mooring lines in the event of an emergency. In the event of a fire, oil spill, earthquake, or tsunami, quick release of the mooring lines would allow the vessel to quickly leave the wharf, which could help prevent damage to the wharf and vessel. The quick release hooks have options for mooring line release including electrically at the hook with a push button and/or all lines can be released from the control room.

Tension monitoring enables loading to continue in marginal weather conditions, high velocity current conditions or other conditions where the limits of strain on the mooring lines could result in movement of the vessel resulting in damage to the wharf and/or vessel. These devices will minimize the potential for excessive surge or sway of the vessel (motion parallel or perpendicular to the wharf), which could lead to an oil spill or the parting of mooring lines, or breaking of loading arms. Monitoring would provide the knowledge that the design limits of the mooring are not being exceeded. This permits cost effective use of both the mooring and tankers.

At present, the docking system relies on the pilot's judgment to determine the vessel's approach speed and angle. An Allision Avoidance System would help to prevent damage to the wharf and vessel by monitoring the speed, approach angle, and distance from the dock of the approaching vessel and providing warning if the monitored parameters fall outside preset limits indicating an allision could occur.

Safety technology would provide flexibility in the lease to continually update mitigation requirements and improve safety at the terminal.

Residual Impacts: The above measures would lower the probability of an oil spill by allowing for quick release of mooring lines (OS-3a), monitoring of tension of the mooring lines (OS-3b), allision avoidance (OS-3c), and implementation of state-of-the-art safety equipment (OS-3d). These measures help to reduce the potential for spills and their associated impacts. However, the impacts associated with the consequences of larger spills, greater than 50 bbls, could remain significant (Class I).

Impact OS-4: Group V Oils

Group V oils have a specific gravity greater than 1 and do not float on the water; instead, they will sink below the surface into the water column or possibly to the bottom. Chevron states in their Spill Preparedness and Emergency Response Plan that no reasonable technology currently exists for a Group V response in the San Francisco Bay. Thus, a release of a Group V oil could result in significant impacts (Class I).

OSPR regulations stipulate that all facilities that transfer Group V oil must identify equipment that can be used to monitor and/or recover it. To satisfy OSPR regulations, Chevron has identified several dredging companies that may be able to assist in the event of a spill. These companies can provide dredges, pumps, detection devices (fathometers with frequencies high enough to identify submerged oil), and silt curtains (silt curtains must be ordered from out of the area). It is difficult to monitor and predict the movement of Group V oils and to recover the oil while it is in the water. Consistent with the findings of the Section 4.3, Water Quality, a Group V oil spill would be a significant, adverse (Class I) impact.

<u>Mitigation Measures for OS-4</u>:

OS-4. Chevron shall confer with the California State Lands Commission (CSLC) regarding Group V oil spill response technology including potential new response equipment and techniques that may be applicable for use at the Long Wharf. Chevron shall work with the CSLC in applying these new technologies, as agreed upon, if recommended for this facility.

<u>Rationale for Mitigation</u>: This measure would provide flexibility in the lease to continually update mitigation requirements and improve response capabilities for response to Group V oils by requiring Chevron to implement the latest response technologies.

<u>Residual Impacts</u>: This measure may reduce the potential impacts from releases of Group V oils, but may not reduce the impact to not significant. Thus, the residual impact could remain significant (Class I).

Impact OS-5: Terminal Spills from Pipelines during Non-Transfer Periods.

Spills from the terminal during non-transfer periods would be associated with pipelines and are considered a significant (Class II) impact if spills are less than 50 bbls, or significant (Class I) impacts for spills greater than 50 bbls.

Chevron has an extensive pipeline inspection program in place (Section 2.3.2, Physical Description of Long Wharf). The existing conditions and stability of the Long Wharf are addressed in Section 4.11.1, Environmental Setting, and conclude that the comprehensive wharf upgrade program completed in 2000, would prevent expected seismic events from causing significant damage to the wharf resulting in oil and/or petroleum releases. It was concluded that the wharf pipelines are flexible enough to withstand some movement from an earthquake without failure. It was also concluded that the pipeway on which the pipelines rest is in very good condition. Specialty paints or mastic provide external corrosion protection for pipelines, pipeline laterals, and DCMA loading arms.

Should leakage from a pipeline, or oil containment or recovery system occur during routine piping and loading/unloading operations, impacts would be considered significant (Class II) impact if spills are less than 50 bbls, or significant (Class I) impacts for spills greater than 50 bbls.

Mitigation Measures for OS-5:

OS-5. Implement MM OS-3d.

Rationale for Mitigation: The measure OS-3d would require a comprehensive preventative maintenance program with periodic inspections to help to lower the probability of oil spills and their associated impacts.

Residual Impacts: The impacts associated with the consequences of larger spills could remain significant (Class I).

Impact OS-6: Potential for Fires and Explosions and Response Capability

Public areas are beyond the hazard footprint boundary; thus fires and explosions would not cause a public safety risk. However, the Wharf's Operations Manual does not address fire emergency procedures and a fire and/or explosion could lead to a release of oil. A significant adverse impact has been identified (Class II).

Risk Potential and Safety Features

Although there have been no reported fires or explosions at the Long Wharf during the past 10 years, fires and explosions are possible at the terminal involving vessels and/or the terminal itself. Chevron has instituted several measures to minimize the potential for fires and explosions.

First, vessels loading or unloading low-flash cargoes (cargoes having a flash point of less than 150°F) are required to have properly operating inert gas systems (IGS). An IGS generates an inert gas that is injected into the cargo tanks to displace the oxygen to a level that will not support ignition. The VPIC is required to verify that the tanks are inerted and that the IGS is working properly before transfer operations can commence. Products with flash points greater than 150°F do not generate enough vapors to support ignition unless the product is heated to a temperature above 150°F. The Long Wharf does not transfer any products that would produce gas cloud hazard footprints that would cause health and safety risks to the public.

A second potential area for a fire or explosion is the VCS. The VCS is described in Section 2.3.2, Physical Description of Long Wharf. The VCS is designed to provide fire and explosion protection. To prevent fires and explosions in the system, natural gas is injected into the vapor stream to enrich the recovered vapors (vapors coming off the vessel during loading operations) to 200 percent of the Upper Explosive Limit (UEL). A hydrocarbon analyzer measures and verifies that the proper enrichment values are met. Nitrogen is used to purge the vapor hose at the end of all vapor transfer operations. An insulating unit electrically isolates the vapor hose from the Long Wharf. Static charges developed in the hose during vapor transfer will flow back to the vessel. An insulating flange is provided at the berth end of the hose to electrically isolate the hose and the vessel from the berth.

A detonation arrester is installed in the vapor pipeline of each berth to prevent a flame from passing from the Long Wharf to the ship. Chevron submitted information on the VCS, as originally designed and installed, to the USCG in compliance with the requirements of 33 CFR 154. Chevron has also performed a Safety Analysis Function Evaluation of the VCS. A copy of this analysis is contained in Chevron's Wharf Operations Manual. A letter of adequacy for the VCS has been issued by the USCG (1992). The USCG reviews the VCS test records as part of their annual facility inspection. Hence, a less than significant impact would be expected from the VCS.

Aspen Environmental Group (1992), based on the MMS Tanker Spill Database, showed that 21.6 percent of spills greater than 1,000 bbls at a pier were due to fires or explosions. Chambers Group (1994) estimated that the probability of a fire or explosion per vessel call at the Unocal (now Conoco/Phillips) Rodeo Marine Terminal is 1×10^{-6}. Based on the safety features at the Long Wharf, the Chambers Group estimate appears to be appropriate for vessel loading operations at the Long Wharf. This estimate results in an expected mean time between fires or explosions at the Long Wharf of 1,100 years. Note that the probability of spills includes those caused by fires and explosions.

Hazard Footprint Area Generated by Radiant Heat or Explosion

A fire could result in the generation of radiant heat and an explosion could create flying debris and blast overpressure, both of which could have an impact on members of the public. The Ports of Los Angeles (POLA) and Long Beach (POLB) have Risk Management Plans (POLB 1981; POLA 1983) as addenda to their Port Master Plans, which specify the methodology to be used for calculating "hazard footprints" from marine terminals and tank vessels. These Risk Management Plans do not require hazard footprints to be calculated for vessels equipped with IGSs because the risk of fire and explosion is so small. Nevertheless, this methodology has been used here to calculate the "hazard footprint" or area at risk from fires and explosions. The radiant heat footprint capable of causing second-degree burns to exposed skin after 30 seconds of exposure (1,600 British thermal units [BTU] per square foot per hour) was calculated to be 300 feet around the ships. An explosion involving one of the tanks could send flying debris up to 1,500 feet from the ship.

Neither the radiant heat nor the flying debris hazard footprint is expected to pose a significant hazard to the public because there are no public areas within 1,500 feet of the wharf area (Class III). The nearest shoreline is approximately 2,000 feet from the nearest wharf, while the nearest residence is approximately 4,000 feet from the nearest wharf. Also, the flying debris hazard footprint should not present a hazard to any of Chevron's storage tanks, the nearest of which is over 3,500 feet from the wharves (Class III).

Fire Response Capability

The Long Wharf is equipped with the following fire detection and extinguishing equipment:

- A fire water line throughout the entire wharf is pressurized and available at all times. Fire water manifolds, quick-attack hose boxes, and individual hose hydrants are regularly spaced along the wharf;

- A suction line at the south end of Berth No. 4 can be lowered into the water to take water directly from the Bay if necessary;

- All cargo-handling berths are provided with stores of fire-fighting foam. The foam is aqueous film-forming foam (AFFF), suitable for oil and petroleum-product fires;

- Each personnel shelter, one for each berth, is equipped with a dry chemical fire extinguisher, located near the door of the individual shelter;

- Chevron also maintains its own fire/emergency response department with full-time trained personnel at the Refinery. These personnel are trained in fighting petroleum fires and fires at the Long Wharf. The Long Wharf can access the Refinery Fire Department via radio, emergency hot line, or Refinery phone. The Richmond Fire Department will provide mutual aid upon request from the Chevron Fire Department.

Chevron just completed a major upgrade to their fire protection system to meet the requirements of MOTEMS. They replaced approximately 2,000 feet of 8-inch fire water pipeline with 10-inch pipe on the main wharf, installed a new diesel engine driven fire water pump, and installed 250 feet of 12-inch fire main and new distribution piping connections to existing equipment. Fire flow meets the requirements of MOTEMS.

The first line of defense for a fire onboard a tanker or tank barge is the onboard fire protection systems. Tankers are required by federal regulations (46 CFR 34) to have sophisticated firefighting systems that include fire pumps, piping, hydrants, and foam systems. Tank barges are only required to have portable fire extinguishers, while some are equipped with built-in systems. The tank vessel crews are trained in the use of the firefighting equipment. The onboard firefighting equipment is sufficient to extinguish most fires.

The following response capability is available to assist in fighting shipboard and wharf fires. Chevron has recently retrofitted the Phoenix to provide foam firefighting capability at up to 7,000 gpm from the front monitor. San Francisco Fire Department has the ability to send two fire boats with 30,000 gpm capacity.

The USCG has prepared and issued a Marine Fire Fighting Contingency Plan (USCG 2000). The plan addresses risk assessment including damage potential, strategic planning, management of response efforts, and response resources available. This addresses what the USCG provides to manage and coordinate resources in the event of a tanker fire.

No discussion or procedures for dealing with tank vessel fires or for conducting periodic fire drills could be found in Chevron's manuals addressing fires or emergency response. This has been identified as a deficiency in the manual and in planning for emergency response, therefore, the potential for a significant, adverse (Class II) impact results.

Mitigation Measures for OS-6:

OS-6a. Chevron shall implement MM OS-3a to provide for quick release devices that would allow a vessel to depart the wharf quickly and help in the event of a fire.

OS-6b. Chevron shall develop a set of procedures and conduct training and drills for dealing with tank vessel fires and explosions for tankers berthed at the Long Wharf. The procedures should include the steps to follow in the event of a tank vessel fire and describe how Chevron and the vessel will coordinate activities. The procedures shall also identify other capabilities that can be procured if necessary in the event of a major incident. The procedures shall be submitted to the U.S. Coast Guard and California State Lands Commission within 90 days of lease renewal. The plan shall be consistent with the requirements of section 3108F2.2 of 24 CCR, Part 2, California Building Code, Chapter 31F.

Rationale for Mitigation: MM OS-3a will provide for quick release of mooring lines to prevent damage to the wharf and vessel.

For Impact OS-6b, Chevron's Operations Manual presently has no discussion or procedures for dealing with tank vessel fires or emergency response. Procedures, training, and drills need to be in place in planning for emergency response, so that the wharf operations crew follows appropriate steps to ensure that emergency response measures are implemented without incident in an emergency situation. While this is a MOTEMS requirement, MOTEMS implementation would not be required for several years, thus the deficiency would remain. The mitigation measure requires that a plan be prepared in 90 days to safeguard the Long Wharf and berthing vessels.

With these measures, impacts would be reduced to less than significant.

4.1.4.2 Accidents and Safety Risk Within the Bay and Outer Coast

Impact OS-7: Response Capability for Accidents in Bay and Outer Coast.

Spills from accidents in the Bay could result in impacts to water quality or biological resources that could be significant adverse (Class II) impacts for those that can be contained during first response efforts; or significant adverse (Class I) impacts that would have residual impacts. While Chevron does not have legal responsibility for tankers it does not own, it does have responsibility to participate in improving general response capabilities.

Probability of Bay Vessel Traffic Accidents

The probability estimates for tanker and barge spills from vessel traffic accidents are based primarily on data contained in the Unocal San Francisco Refinery Marine Terminal EIR (Chambers Group 1994), GTC EIR (Aspen Environmental Group 1992), and the Port Needs Study (USCG 1991). Table 4.1-10 presents the spill probabilities from three causes: (1) collisions, which are impacts between two or more moving vessels, (2) rammings (or allisions), which are moving vessels running into stationary objects, and (3) groundings for both tankers and barges. These probabilities were calculated from the individual probabilities of small, medium, and large vessels, considering the volume of traffic in each category (derived from data in USCG 1991). In accordance with the methodology in Aspen, a 0.1 reduction factor has been applied to tanker and barge groundings for double-bottom and double-hull vessels and a 0.71 reduction factor has been applied to tanker and barge collisions for double-hull vessels. The estimated probabilities of spills from the various types of tankers and barges, after applying the reduction factors, are presented in Table 4.1-11.

Table 4.1-10
Spill Probabilities by Cause for Tankers and Barges

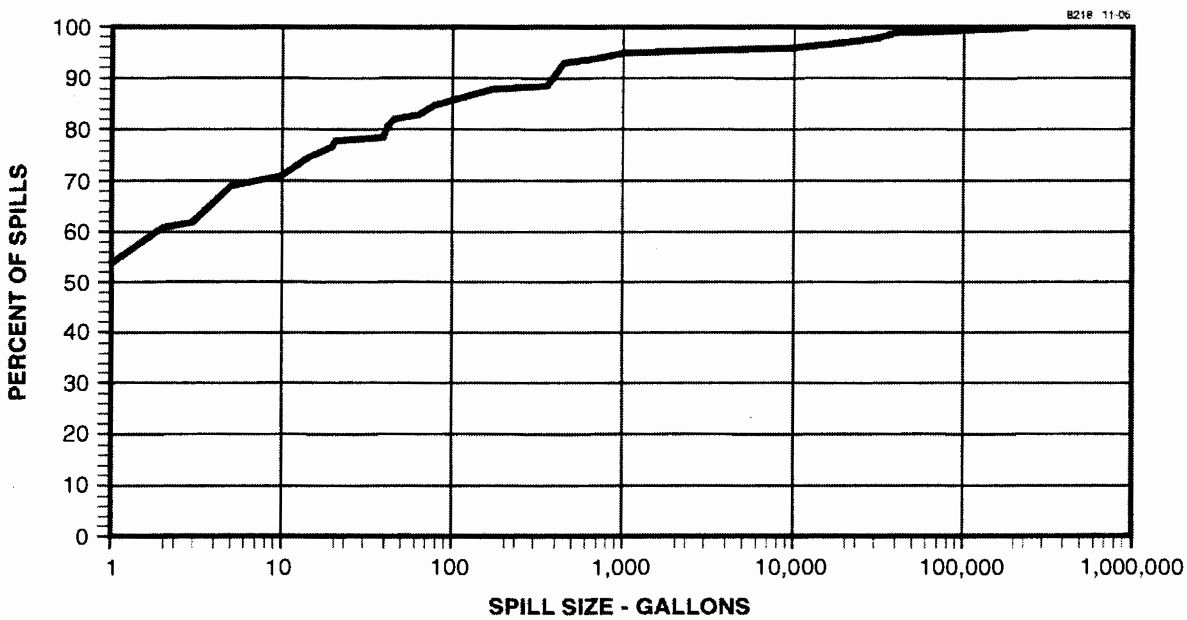
Vessel Type	Probability of Spill > 100 Gallons per Vessel			
	Collision	Allision	Grounding	Total
Tanker	9.12×10^{-7}	1.42×10^{-7}	5.58×10^{-7}	1.61×10^{-6}
Barge	4.86×10^{-6}	1.50×10^{-6}	6.02×10^{-7}	6.96×10^{-6}
Source: Derived from data contained in USCG 1991.				

Table 4.1-11
Spill Probabilities per Vessel Type

Vessel Type	Probability of Spill > 100 Gallons per Vessel		
	Single Hull	Double Bottom	Double Hull
Tanker	1.6×10^{-6}	1.1×10^{-6}	8.4×10^{-7}
Barge	7.0×10^{-6}	N/A	5.0×10^{-6}

Chevron has stated that currently approximately 58 percent of all tank vessels calling at the Long Wharf are double-hull and that the vast majority of the tankers are double-hull. As stated earlier, it has been estimated that the Long Wharf can handle up to 900 vessel calls per year. Based on historical data, it has been presumed that half the vessel calls are tankers and half barges. It has also been presumed that 5 percent of the tankers are not double-hull. Table 4.1-12 presents the annual probabilities of spills from vessels transiting San Francisco Bay to/from the Long Wharf. This equates to one spill every 290 years.

The distribution of a spill size greater than 238 bbls (10,000 gallons) for tankers and tank barges, given there is a spill, was derived from Cutter Information Corporation (1989). The distributions for tankers and tank barges are similar for smaller spills; however, the probability of a larger spill is higher for tankers because they can carry more oil (Figure 4.1-5). The figure shows that the vast majority of spills are small. Unfortunately, the limitation of the Cutter database is that it does not include spills less than 238 bbls and hence, it is not possible to combine the spill distribution with the estimated probability of a spill.



Source: California State Lands Commission and Cutter Databases

Chambers Group

CUMULATIVE SPILL SIZE DISTRIBUTION
Figure 4.1-5

Table 4.1-12
Annual Probabilities of Spills from Vessels Calling at the Long Wharf While Transiting the San Francisco Bay

Vessel Type		Single Hull	Double Hull	All
Tankers	No. vessels calling in 1998	22	428	450
	Annual prob. of release	3.5×10^{-5}	3.6×10^{-4}	4.0×10^{-4}
Barges	No. vessels calling in 1998	356	94	450
	Annual prob. of release	2.5×10^{-3}	4.7×10^{-4}	3.0×10^{-3}
Tankers and Barges	No. vessels calling in 1998	378	522	900
	Annual prob. of release	2.5×10^{-3}	8.3×10^{-4}	3.4×10^{-3}

Table 4.1-13 summarizes the expected number of spills per year from the Long Wharf and tank vessels calling at the Terminal while transiting the Bay. As can be seen from the table, the potential for a spill from the Terminal, including the tank vessel while it is at the Terminal, is much greater than the potential of a spill from a tank vessel transiting the Bay.

Table 4.1-13
Expected Number of Annual Spills from the Long Wharf and Tankers Calling at the Wharf While Transiting the Bay

Location	Expect Number of Spills Annually			
	> 0 Gal.	> 100 Gal.	> 1,000 Gal.	> 42,000 Gal. (1,000 bbl)
Terminal	43	0.65	0.22 (every 4-5 years)	0.034 (every 29 years)
Transiting Tankers		0.0034 (every 290 years)		

Consistent with the findings of the other resource disciplines in this EIR, it was concluded that, although the probability of a large spill is small, the consequences of a spill could be significant (see Section 4.2, Water Quality, Section 4.3, Biological Resources, Section 4.4, Commercial and Sport Fisheries, Section 4.5, Land Use/ Recreation, and Section 4.9, Visual Resources/Light and Glare. Based on the anticipated spills and on the impacts to resources, it is concluded that the impact of spills would be adverse and significant and range from spills of 50 bbls or less that can be contained during first response efforts with rapid cleanup (Class II) to those larger or complex spills that result in a significant (Class I) impacts with residual effects after mitigation. Responses to tank vessel oil spills when not at the Long Wharf are discussed below.

Tank Vessel Spills Within the Bay

Response to a spill from a tanker is the responsibility of the vessel owner/operator. As a result of OPA 90, each vessel is required to have an oil plan that identifies the worst-case spill (defined as the entire contents of the vessel) and the assets that will be used to respond to the spill. Chevron, which owns and/or operates many of tankers that call at the Long Wharf, has developed its plans in response to OPA 90. As mentioned above, Chevron is a member of MSRC, which can supply the resources required by the USCG/OPA 90. The response capability of other tanker companies and barge companies is less known, but must be documented in their oil spill response manuals. All tanker companies operating within California waters, must demonstrate by signed contract to the USCG and CDFG that they have, either themselves or under contract, the necessary response assets to respond to a worst case release as defined under Federal and State regulations.

Response to a vessel spill would consist of containment (deploying booms), recovery (deploying skimmers), and protection of sensitive resources. If the oil were to reach the shore and/or foul wildlife, the shoreline and wildlife would be cleaned. MSRC would make their local equipment and manpower available. If required, additional equipment and manpower would be made available from local contractors, OSROs, and MSRC at other locations.

While MSRC can provide the equipment and manpower required by OPA 90 and OSPR, it is unlikely that they could prevent a large spill from causing significant contamination of the shoreline. The Regional Resource Manual and the Area Contingency Plan identify sensitive resources within the Bay Area and methodologies for protecting and cleaning up those areas. A large spill from a tank vessel can be classified as a significant, adverse (Class I) impact depending on spread of the spill and resources impacted as presented in other sections of this document.

Tank Vessel Spills Outside the Bay

Again, the vessel owner/operator is responsible for cleaning up spills and must be able to identify what assets will be used. MSRC can provide the required response resources outside the Bay.

The MSRC Oil Spill Contingency Plan and Area Contingency Plan identify sensitive resources along the outer coast and measures to be used in protecting these resources.

Response to spills outside the Bay would be somewhat different from that inside the Bay. First, the environment outside the Bay may be more difficult to work in because of sea conditions. Booms become less effective as wave heights increase, losing much of their effectiveness once waves exceed 6 feet. There may be conditions when it would be impossible to provide any response actions. However, when wave energy is such that it is impossible to deploy response equipment, the wave energy causes the oil to be dispersed much more rapidly.

Second, it may not be necessary to try to contain and clean up a spill if it does not threaten the shoreline or a sensitive area. In this case, the spiller would monitor the trajectory of the spill in accordance with methodologies presented in the Area Contingency Plan.

If the spill could affect the shoreline or sensitive area, then the response efforts would consist of containing and cleaning as much oil as necessary, and protecting sensitive areas.

The MSRC large response vessels are located inside the Bay. It would take the vessels a minimum of 2 hours to get underway and exit the Bay, and 24 hours to reach the Fort Bragg area. Again, additional resources would be available from other response cooperatives and other MSRC sites. While the response capability meets the minimum requirements of OPA 90 and OSPR, a large spill could still result in significant, adverse impacts (Class I) to sensitive resources as described in other resources sections of this document.

Mitigation Measures for OS-7:

OS-7a. Chevron shall participate in an analysis to determine the adequacy of the existing VTS in the Bay Area, if such a study is conducted by a Federal, State, or local agency during the life of the lease. Agencies such as the San Francisco Bay Harbor Safety Committee often conduct studies of safety issues within the Bay Area. As vessel traffic increases in and around the Bay Area and as technology improves, it may be necessary and feasible to upgrade and expand the VTS in and around the Bay Area. Chevron shall participate in this analysis and contribute a pro-rata share toward the upgrade and expansion of the system, if required to do so by the CSLC.

OS-7b. Chevron shall respond to any spill as if it were its own, without assuming liability, until such time as the vessel's response organization can take over management of the response actions in a coordinated manner.

Rationale for Mitigation: As presented above, the tanker owner/operator has responsibility for spills from their tanker. Chevron has responsibility for Chevron-owned tankers, but does not have any legal responsibility for other tankers. As a participant in any analysis to examine upgrades to the VTS, Chevron can help to improve transit issues and response capabilities in general, which help to reduce the potential for incidents and the consequences of spills within the Bay. For a spill near the Long Wharf, Chevron is more suited to provide immediate response to a spill using its own equipment and resources, rather than waiting for mobilization and arrival of the vessel's response organization. The Long Wharf staff is fully trained to take immediate actions in response to spills. Such action will result in a quicker application of oil spill equipment to any spill and improve control and recovery of such spill.

Residual Impacts: Even with these measures, the consequences of a spill could result in significant, adverse impacts (Class I).

4.1.5 Impacts of Alternatives

Impact OS-8: No Project Alternative

With no lease, there would be no potential for tanker spills at the Long Wharf, a beneficial impact (Class IV). However, the potential for tanker spills would be transferred to other terminals in the Bay. Decommissioning of the wharf would result in less than significant impacts (Class III) associated with pipeline purging and removal.

Under the No Project Alternative, Chevron's lease would not be renewed and the existing Long Wharf would be subsequently decommissioned with its components abandoned in place, removed, or a combination thereof. The decommissioning of the Long Wharf would follow an Abandonment and Restoration Plan as described in Section 3.3.1, No Project Alternative.

Under the No Project Alternative, alternative means of crude oil / product transportation would need to be in place prior to decommissioning of the Long Wharf, or the operation of the Chevron Refinery would cease production, at least temporarily. It is more likely, however, that under the No Project Alternative, Chevron would pursue alternative means of traditional crude oil transportation, such as a pipeline transportation, or use of a different marine terminal. Accordingly, this EIR describes and analyzes the potential environmental impacts of these alternatives. For the purposes of this EIR, it has been assumed that the No Project Alternative would result in a decommissioning schedule that would consider implementation of one of the described transportation alternatives. Any future crude oil or product transportation alternative would be the subject of a subsequent application to the CSLC and other agencies having jurisdiction, depending on the proposed alternative.

During decommissioning of the wharf there would be a small risk of a spill during the pipeline purging and removal process that could be contained, however, the wharf contains the necessary equipment to contain and clean this type of spill and thus impacts are considered adverse, but less than significant (Class III).

Following decommissioning, with no wharf, there would be no potential for tanker spills at the terminal nor would there be a potential for tanker fires or explosions at the terminal. However, the potential for tanker spills would be transferred to other terminals in the Bay. The potential risk from the VCS would also be removed. Thus, with lease denial, there would be no Long Wharf, and no potential for risk or safety impacts (Class IV).

OS-8: No mitigation is required.

Impact OS-9: Full Throughput Via Pipeline Alternative and Use of Other Marine Terminals

In order for the Refinery to operate, other marine terminals would be used, and crude and product would be transferred by pipelines to the Long Wharf. A leak or rupture in a pipeline could result in a Class I or II Impact; vessel spill risk would be transferred to and exacerbated at other terminals.

The demand for crude oil at the nearby refineries is not expected to decrease. Hence, the crude oil would have to be imported in some other manner. This could be by tank vessel through other marine terminals and/or by pipeline. If the crude oil were imported through other marine terminals, the overall probability of an oil spill in the area would be 40 expected to be approximately the same. Depending on the location of the terminals, different sensitive resources could be impacted in the event of a release. Also, depending on the location of the marine terminals that would be used, the length of the pipelines connecting the marine terminal to the refineries would vary. This could increase the risk of a pipeline release.

Replacement of Crude Oil Volumes via Pipeline

Spills from pipeline transportation of crude oil present less of an impact on the environment than spills from tanker transportation. The probability of a spill is not necessarily less; however, the maximum amount of oil that can be released from a pipeline is generally less than that which can be released from a tanker. In addition, oil spilled on land generally causes less environmental impact than oil spilled on water.

Failure rates for pipelines are generally described in terms of spills per unit length per year. Pipeline characteristics that can affect potential failure rates include age, size, design, depth of burial, corrosion protection, wall thickness, and operating temperature. A range of 0.03 to 0.5 releases per year per 100 miles of pipeline has been cited in recent reports (ADL 1986; PPC 1991; U.S. Department of Agriculture [USDA] 1991; Aspen Environmental Group 1996).

Aspen, based on an analysis of pipeline spill statistics including the above referenced reports, presented the following spill estimates for pipelines with diameters greater than 16 inches:

- Leaks --
  - 0.08 per 100 miles per year for pipelines 40 years or older;
  - 0.03 per 100 miles per year for "existing" pipelines (approximately 20 years old);
  - 0.012 per 100 miles per year for "new" pipelines (in first 10 years).

- Ruptures --
  - 0.04 per 100 miles per year for "old" pipelines;
  - 0.016 per 100 miles per year for "existing" pipelines;
  - 0.006 per 100 miles per year for "new" pipelines.

A leak is defined as a relatively small rate of release from a pipeline. A typical cause would be a small hole that results due to corrosion pitting, a leaking flange, or valve. A rupture represents a relatively high rate of release as might occur if the pipe were breached by an external force.

The maximum spill volume is a combination of drainage potential and the pumping rate for the period of time before the breached segment can be isolated. Worst-case calculations of spill volumes are normally based on the assumption of complete drainage by gravity of the section of pipe between high ground and the point of rupture (called drainage volume). Additional spillage depends on the flow rate and response time to shut down the pipeline. Analysis of drainage volume assumes that the drainage will be complete. This may not necessarily be the case because: (1) the breach may be less than a full rupture, (2) a block valve within the affected pipe section may be successfully closed before complete evacuation occurs, or (3) a check valve in an uphill stretch can prevent backflow of oil between high ground and the valve. The gradient of the terrain determines the hydrostatic force available to evacuate the pipe after the pumps are turned off. Evacuation will take much longer in nearly flat terrain. The average spill size from 16-inch-diameter crude oil pipelines, as reported to OPS between 1980 and 1990, was 2,680 bbls (USDA 1991). This is the volume in 2 miles of 16-inch pipe.

Based on the probability estimates previously discussed, the annual probability of a leak and rupture of a new pipeline constructed from the Bakersfield area to the Chevron Refinery (approximately 350 miles) would be 4.2 percent and 5.6 percent, respectively. In addition, damage could occur to other nearby pipelines during the construction process. A leak or rupture could result in a significant, adverse (Class I) impact where sensitive resources are affected. Class II impacts in areas that can be contained and cleaned up (such as roadways) could also occur.

Crude Intake via Other Marine Terminals

This alternative would shift the risk associated with crude intake at the Long Wharf to other terminals in the Bay. This could either slightly increase or decrease the risk, depending on the characteristics and locations of the terminals used. Characteristics that could alter the risk include:

- The tanker may have to travel farther to reach the other terminals. This would be true if the other terminals were in the Carquinez Strait, such as Shell Martinez, CONOCO/PHILIPS, and Exxon Benicia. Alternatively, using terminals in the Richmond area may require tankers to travel about the same distance;

- The added tanker traffic at the other refineries may create congestion and increase the risk for a collision or other incident;

- The other terminals may have a different (better or worse) level of spill response; and

- Use of other marine terminals may not provide the opportunity to apply mitigation measures as compared to the opportunity for mitigation for the proposed Project because there may not be a venue, such as a lease renewal or permit modification, upon which to attach a permit condition.

In addition to the above, a new pipeline or pipelines may have to be constructed from the other terminal(s) to the Chevron Refinery. As stated above, the transportation of crude oil by pipeline does have the potential for releases and the potential to damage other pipelines during construction. A leak or rupture would result in a significant, adverse (Class I) impact where sensitive resources are affected. Class II impacts in areas that can be contained and cleaned up (such as roadways) could also occur. Shifting the input to other terminal(s) would most likely increase the overall risk of a spill slightly.

Product Export via Other Marine Terminals

As with crude oil discussed above, using other marine terminals to export products would shift the potential risk to the other terminals with the same advantages and disadvantages discussed for crude oil. The fact that there are many different products to be exported complicates the process and may slightly increase the risk. Chevron would either have to build multiple pipelines to handle all of the various products or ship the products in batches through a single line. Batching the products may require additional tanks to be built at the other terminals to temporarily store the products. This would increase the handling and potential for spills. Class I or II impacts could occur depending on whether a spill could be contained and cleaned up with no residual effects.

Comparison of Transportation Methods

Table 4.1-14 taken from the Cajon Pipeline Draft EIR (EIP 1992) compares both the spill rate and deaths per billion-ton miles of petroleum transported.

Table 4.1-14
Spill Rates and Death Rates for Various Petroleum Transport Modes

Mode	Spill/ Billion-Ton Miles	Deaths/ Billion-Ton Miles
Pipeline	0.5	0.01
Tanker	9.4	0.31
Rail Tanker	7.8	2.5
Truck	44.6	10.9

As shown in the table, the spill rate for rail tankers, tankers, and trucks is considerably higher than for pipelines, while truck transportation has by far the highest spill rate. The rail tanker spill rate is similar to that for tankers. The death rate is considerably higher for both rail and truck, with truck being the highest. The reason that the death rate is higher for rail and truck transportation is twofold. First, these modes of transportation are often commingled with public transportation, especially road traffic. Second, a spill often involves a high-energy impact (collision, overturning, derailment), which can lead to a fire or explosion. Therefore, both marine and pipeline transportation is preferable over rail and truck transportation.

Mitigation Measures for OS-9:

OS-9a. Mitigation described for the proposed Project (MM OS-3 through MM OS-6), would be required at other terminals. It is unknown at this time whether such measures are in place at other terminals.

OS-9b. Mitigation for pipelines includes that presented in MM GEO-8, adhering to proper engineering design, inspection, maintenance, and retrofitting.

Rationale for Mitigation: As with the proposed Project, the mitigation applied to the other terminals would lower the probability of spills and increase response capabilities at the other terminals. The mitigation applied to the pipelines would lower the probability of spills.

Residual Impacts: Impacts associated with the Long Wharf would be reduced, but impacts from the pipelines and other terminals would increase and have the potential to remain significant (Class I). Impacts from the pipelines would remain significant (Class I) for a large spill to land resources.

Conceptual Consolidation Terminal Alternative

Impact OS-10: Conceptual Consolidation Terminal Alternative

With no lease, impacts similar to those described for the Long Wharf would occur or be transferred to the consolidated terminal and spill impacts would be as described in OS-9 (Class I and II). Impacts from use of existing and/or new pipelines would be significant (Class I or II) if a spill were to occur.

As with the No Project Alternative, this alternative would shift some of the risk associated with vessel traffic and spills to another location, and shift some of the responsibility for containment and cleanup to another operator. The transportation of crude oil and products by pipeline between the consolidated marine terminal and the Chevron Refinery would introduce an additional risk over that of the proposed Project because another factor (the pipeline between the marine terminals) would be part of the project. Impact OS-9 discusses the risk from pipelines. Spills would result in significant, adverse (Class I or Class II) impacts depending on whether the spill could be contained and cleaned quickly with no residual effects.

Using another marine terminal to export products would shift the potential risk to the other terminals with the same advantages and disadvantages discussed for crude oil. The fact that there are many different products to be exported complicates the process and may slightly increase the risk. Chevron and the consolidated terminal would either have to build multiple pipelines to handle all of the various products or ship the products in batches through a single line. Batching the products may require additional tanks to be built at the other terminals to temporarily store the products. This would increase the handling and potential for spills. Class I or II impacts could occur.

Mitigation Measures for OS-10:

OS-10a. Mitigation, as described for the proposed Project (MM OS-3 through MM OS-6), would be required at other terminals.

OS-10b. Application of MM OS-9b for pipelines.

Rationale for Mitigation: Since this alternative would essentially transfer the potential risk from the Long Wharf to the consolidated terminal, OS-10a would ensure that the consolidated terminal presents no more of a risk than the mitigated Long Wharf. OS-10b applied to the pipelines would lower the probability of spills.

Residual Impacts: Impacts associated with the Chevron facility would be reduced, but impacts at the consolidated terminal would be significant (Class I) as would the impacts from pipelines.

4.1.6 Cumulative Projects Impact Analysis

Impact CUM-OS-1: Upset Conditions

All terminals and tanker/barge operators are required by Federal and State regulations to demonstrate that they have, or have under contract, sufficient response assets to respond to worst-case releases. Even so, oil spills can still result in significant, adverse impacts (Class I and Class II) to the environment depending on whether first response efforts can contain and cleanup the spill. Chevron contributes incrementally to the cumulative environment.

Spills from a Marine Terminal

The potential exists for spills at all marine terminals operating within the Bay. The actual probability varies depending on the design and operational procedures in place. The potential impacts of spills vary depending on the location of the terminals and the response equipment and procedures available. Terminals, such as the Chevron Long Wharf, which have undergone recent upgrades and lease renewal considerations, may present less of an impact because of the additional mitigation measures required as part of the lease renewal process.

Spills from Tankering Inside the Bay

Chambers Group (1994) used data from the Marine Exchange (1992), CSLC (1992), Corps (1990), USCG (1991), and nautical charts to estimate tanker and barge traffic within the Bay. Based on the amount of tanker and tank barge traffic along the various routes within the Bay, cumulative probabilities of a spill were developed for various sections within the Bay. These probabilities were then used to conduct the probabilistic oil spill modeling for cumulative tanker and tank barge traffic within the Bay.

The expected mean time between spills for all tanker and tank barge traffic inside the Bay for three minimum size spills is presented in Table 4.1-15. Based on estimated mileage traveled within the Bay, vessel traffic associated with the Long Wharf is approximately 15 percent of the total probability of a spill from tanker and tank barge traffic in the Bay.

Table 4.1-15
Cumulative Tank Vessel Expected Mean Time Between Spills Inside the Bay

Spill Size (bbls)	Expected Mean Time Between Spills (Years)
238	36
1,000	48
10,000	238

Spills from Tankering Outside the Bay

Chambers Group (1994), using data from the Marine Exchange, which listed the last and next port of call for all tankers calling at marine terminals in the San Francisco Bay Area, estimated the number of annual tanker trips along various routes outside the Bay. The expected mean time between spills outside the Bay is shown in Table 4.1-16.

Table 4.1-16
Cumulative Tank Vessel Expected Mean Time Between Spills Outside the Bay

Spill Size (bbls)	Expected Mean Time Between Spills (Years)
1,000	42
10,000	123

Spill Response

An impact on spill response capability could occur if there were two or more spills at the same time; however, the probability of this is extremely small. Having many marine terminals and extensive vessel traffic in the Bay tends to increase the total amount of spill response equipment and services available.

All terminals and tanker/barge operators are required by Federal and State regulations to demonstrate that they have, or have under contract, sufficient response assets to respond to worst-case releases. All terminals are under contract with one or more OSROs. These OSROs can provide all the necessary equipment and manpower to meet the requirements of existing regulations; however, oil spills can result in significant, adverse impacts (Class I and Class II) to the environment depending on whether first response efforts can contain and cleanup the spill. Tankers and tank barges operating in U.S. and California waters must certify that they have the required capability under contract. Chevron contributes cumulatively to this impact.

<u>Mitigation Measures for CUM-OS-1</u>:

CUM-OS-1. Mitigation for Chevron remains as described for the proposed Project, implementation of MM OS-3 through MM OS-6.

<u>Rationale for mitigation</u>: Implementation of mitigation measures similar to MM OS-3 through MM OS-6 at all terminals would provide for increases in response capability and the lowering of the probability of accidents. However, each terminal would require individual evaluation of potential for impacts. These measures can reduce the consequences of small spills near a terminal that can be quickly contained and cleaned to less than significant. Chevron contributes incrementally to the cumulative environment.

Residual Impacts: Even with mitigation applied, risk of oil spills, typically larger than 50 bbls, could result in environmental impacts that remain significant (Class I).

Table 4.1-17 summarizes Operational Safety/Risk of Accidents impacts and mitigation measures

Table 4.1-17
Summary of Operational Safety/Risk of Accidents Impacts And Mitigation Measures

Impacts		Mitigation Measures	
OS-1:	Wharf Deck Drainage System	**OS-1:**	No mitigation required.
OS-2:	Potential Impacts from Gasoline and Other Highly Volatile Product Releases	**OS-2:**	No mitigation required.
OS-3:	Potential for Spills and Response Capability for Containment of class I-IV Oil Spills from Terminal during Transfer Operations	Within 12 mo. of lease implementation, Chevron shall:	
		OS-3a:	Provide quick release devices.
		OS-3b:	Install tension monitoring devices at Berth 1. Install at other berths within 6 months if vessel drifts more than 7 ft.
		OS-3c:	Install Allision Avoidance System (AAS) if required by CSLC in consultation with USCG and Bar Pilots.
		OS-3d:	Develop a comprehensive preventative maintenance program including periodic inspection of transfer operations.
OS-4:	Group V Oil Spills	**OS-4:**	Confer with CSLC regarding Group V response technology and implement new technology and procedures as recommended.
OS-5:	Terminal Spills from Pipelines during Non-Transfer Periods	**OS-5:**	Implement MM OS-3d.
OS-6:	Potential for Fires and Explosives and Response Capability	**OS-6a:**	Implement MM OS-3a.
		OS-6b:	Develop a set of procedures and conduct training and drills for tank vessel fires and explosion for tankers berthed at the Long Wharf.
OS-7:	Response Capability for Accidents in Bay and Outer Coast	**OS-7a:**	Participate in an analysis to determine the adequacy of the VTS in the Bay Area.
		OS-78:	Agree to respond to the spill as if it were its own, without assuming liability.
OS-9:	No Project Alternative	**OS-8:**	No mitigation required.
OS-9:	Full Throughput Via Pipeline and Use of Other Marine Terminals	**OS-9a:**	No mitigation required for Long Wharf, however, other terminals would need mitigation similar to proposed Project.
		OS-9b:	Follow MM GEO-8.

Table 4.1-17 (continued)
Summary of Operational Safety/Risk of Accidents Impacts And Mitigation Measures

Impacts	Mitigation Measures
OS-10: Conceptual Consolidation Terminal Alternative	**OS-10a:** No mitigation required for Long Wharf, however, other terminals would need mitigation similar to proposed Project. **OS-10b:** Application of MM OS-9b for pipelines.
CUM-OS-1: Upset Conditions	**CUM-OS-1:** Implement MM OS-3 through MM OS-6.

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